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FAMILY SERPULIDAE (POLYCHAETA, SEDENTARIA) FROM THE BOHEMIAN CRETACEOUS BASIN

ABSTRACT

This paper deals with the *Serpulidae* BURMEISTER from the Bohemian Cretaceous Basin, a family which has not yet been studied in Czechoslovakia in great detail. Some species were described in papers by A. FRÍČ (1870—1911), others were recorder in various faunal lists. The members of the family *Serpulidae* BURMEISTER coming from most varied sediments of the Bohemian Cretaceous are shown to belong to 21 genera, out of which one is a new generic specimen, and to 49 species, of which 19 are new.

Detailed studies on serpulid worms from Czechoslovak territory have hitherto been made only by F. PRANTL (1948), who paid attention to their occurrences in the Paleozoic, and by P. ČTYROKÝ (1959), who examined the species *Ditrupa cornea* (LINNAEUS) from the Tertiary of southern Moravia.

Three thousand specimens were gathered to study the serpulids from the Bohemian Cretaceous Basin, but only 311 are complete; the other materials are fragments. I had also the opportunity to examine the collections of the National Museum, Prague, the Museum in Moravská Třebová, Poděbrady and Turnov, and the Faculty of Natural Science Charles University, Prague.

The tubes of the family *Serpulidae* BURMEISTER occur in the Bohemian Cretaceous from the marine Cenomanian (*Inoceramus pictus* Zone) to the Coniacian (*I. involutus* Zone) No serpulid worms have yet been found in the Upper Coniacian (*I. subquadratus* Zone) and Santonian (*I. unduloplicatus* Zone) — M. MALKOVSKÝ et al. (1974). Serpulid worm tubes are most abundant in calcareous-clayey sandstone and marlstone, calca-

reous-clay in terrestitial matter of conglomerate, clay organodetrital limestone of a Lower Turonian surf zone, and also in similar Cenomanian rocks as well as calcareous sandstone to sandy limestone of Middle Turonian age. In the other sediments serpulid worms occur to a lesser degree or are rare. In most cases the tubes are well preserved spatially, but are fragmentary in 90 percent of all cases, owing especially to an original mechanical disturbance of the shells, diagenetic processes and sometimes chemical corrosion (migration of elements). The tubes consist of calcite.

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Family *Serpulidae* BURMEISTER, 1837

Subfamily *Filigraninae* RIOJA, 1925

Genus *Filigrana* OKEN, 1815

Filigrana congesticia REGENHARDT, 1961

(Pl. I, Fig. 1, 2)

1961 *Filigrana congesticia* n. sp. — H. REGENHARDT: *Serpulidae etc.*, p. 23, Pl. 2, Fig. 3

Type horizon: Campanian (Actinocamax mammilatus Zone)

Type locality: Ifö (Schonen)

Material: Four complete species colonies and 19 fragments. 60 percent of specimens is spatially deformed.

Description: Irregularly curved tubes accumulated in irregularly intermingled colonies. The number of colonial specimens is variable. Tubes of circular section, with its diameter attaining about 1,8—2 mm. Lumen circular, 1,6 mm in diameter; wall thickness ranges from 0,1 to 0,2 mm. Tubes smooth, without sculpture. Lumen of uniform diameter in anterior and central parts of tube, but suddenly tapering posteriorly. Indications of tabulae observable posteriorly in some specimens.

Tubes grow on rock fragments or on similar object so as to encompass them later they grow upon one another, thereby forming a colony. Cenomanian forms produce colonies with fewer specimens whereas Lower Turonian forms occur in more extensive colonies containing a larger number of specimens. However, a larger grouping of the individuals does not exert any influence upon the development of their additional features.

Remarks and relationships: *Filigrana congesticia* REGENHARDT is the only species of this genus hitherto reported from the Bohemian Cretaceous where occurs rather rarely. Other established forms (*F. faxensis* NIELSEN) and *F. sollistima* (REGENHARDT) are considerably smaller in size, with their maximum diameter and length of tube attaining about 0,4 and 6 mm, respectively.

The tubular fragments of *F. congesticia* REGENHART are similar in their habit to those of *Glomerula gordialis* (SCHLOTHEIM). The two species have an approximately equal diameter of tube cross-section and bear no sculpture [*G. gordialis* (SCHLOTHEIM) in particular]. Small fragments

are virtually indistinguishable, but *G. gordialis* (SCHLOTHEIM) never forms colonies.

The species described by H. REGENHARDT (1961) essentially does not differ from the specimens reported from the Bohemian Cretaceous. A new phenomenon are only the tabular indications sporadically observable in some specimens forming colonies.

Stratigraphical range and localities in the Bohemian Cretaceous: Upper Cenomanian — Plaňany quarry; Lower Turonian — Velim (Skalka), Zbyšlav No 51, Bílá Hora Near Prague, Nová Ves near Kolín.

Genus *Glomerula* NIELSEN, 1931

Glomerula gordialis (SCHLOTHEIM, 1820)

(Pl. I, Fig. 3, 4, 5)

1820 *Serpulites gordialis* n. sp. — E. F. v. SCHLOTHEIM, Petrefaktenkunde, p. 96

1831 *Serpula gordialis* (SCHLOTHEIM) — A. GOLDFUSS: Petrefacta, p. 234,

Pl. 69, Fig. 8

1931 *Glomerula gordialis* (SCHLOTHEIM) — K. B. NIELSEN: Serpulidae, p. 88,

Pl. 1, Fig. 9, 10.

1961 *Glomerula gordialis* (SCHLOTHEIM) — H. REGENHARDT: Serpulidae aus...

p. 26, Pl. 1, Fig. 2

1975 *Glomerula gordialis* (SCHLOTHEIM) — S. WARE: Lower Greensand, p. 112, 113

Holotype: Specimen designated on Pl. 69, fig. 8 — A. GOLDFUSS (1831)

Type horizon: Jurassic, Cretaceous

Material: Sixty-nine complete specimens and large number of fragments of various tubular parts. Tubes consist of calcite. Spatial tube contortion has been observed to be at a minimum.

Description: Tube circular and wound into an irregular ball. Ball coils not united firmly to one another. Aperture hidden in tube ball. Tube section uniform throughout its length. The ranges from 1 to 1,4 mm. The size of the lumen usually remains uniform also along its entire length and decreases at a point where tube wall thickness increases, but this is not a general condition. One to three tabulae can distinctly be observed in the posterior part of the tube. Tube length is about 50 mm. Larger specimens are quite unique. Tube surface usually smooth; fine transverse striae have been found to run anteriorly on tubes of 5 complete specimens.

Tubes are usually attached to various substratum, but there is not distinct specialization. Serpulid cellular layers are weakly developed and not appear as any special forms.

Remarks and relationships: *Glomerula gordialis* (SCHLOTHEIM) is the most abundant serpulid in sediments of the Bohemian Cretaceous Basin. Its presence has been noted in papers by A. FRIČ (1870—1911), J. MAČHÁČEK (1937), J. SOUKUP (1968) and V. ZIEGLER (1972), and it has been cited in most faunal lists on the Bohemian Cretaceous. It is noteworthy that this specimen has been confused with allied or similar species, but the latter occurs less frequently.

G. scitula REGENHARDT, *G. solitaria* REGENHARDT and *G. nuntia* n. sp., i. e. species similar to *G. gordialis* (SCHLOTHEIM), differ especially in the size of their tube cross-section. *G. scitula* REGENHARDT and *G. nuntia* n. sp.

are much smaller and *G. solitaria* REGENHARDT is larger than *G. gordialis* (SCHLOTHEIM). The similarity between *G. gordialis* (SCHLOTHEIM) and *Filograna congesticia* REGENHARDT has been discussed earlier. That *G. gordialis* (SCHLOTHEIM) almost generally possesses tabulae was for the first time noted by H. REGENHARDT (1961), who observed such indications especially in the middle part of the tube, although he denied the presence of true tabulae. I have found that in the material from the Bohemian Cretaceous Basin true tabulae occur only in the posterior part of the tube. It has also been revealed that material shows a certain variability in the wall thickness, a finding so far unknown. This variation is within the limits of 0,1—0,4 mm. And has not been observed even in many members of the family *Serpulidae* BURMEISTER attaining a much greater size.

Stratigraphical range and localities in the Bohemian Cretaceous: Upper Cenomanian — Bílina, Brázdím, Hodkovice (Ve skalách), Korycany, Miskovice; Lower Turonian — Běstvína, Kamajka, Kaňk, Nová Ves near Kolín, Předboj, Starkoč, Velim (Skalka); Middle Turonian — Benátky n. Jizerou, Brandýs n. Orlicí, Česká Třebová, Dolánky, Klokočské Loučky, Kokořín, Libuň, Nouzov near Svitavy, Rovensko p. Troskami, Turnov; Upper Turonian — Čížkovice, Oškobrh, Přerovská hůra, Teplice, Vinařice; Coniacian — Hrdoňovice, Prachovské skály, Valdštejn, Mašov near Turnov.

Glomerula nuntia nov. spec.

(Pl. I, Fig. 6)

H o l o t y p e : Specimen No. 0 5174, Coll. V. Ziegler, of the National Museum Prague, designated on Pl. 1, Fig. 6

T y p e h o r i z o n : Lower Turonian

T y p e l o c a l i t y : Běstvína near Ronov

D e r i v a t i o n o f n a m e : After *nuntia* (Lat.), a messenger of a new serpulid worm sampling locality

M a t e r i a l : Three complete specimens, 6 fragments of various tube parts.

D i a g n o s i s : A species of the genus *Glomerula* NIELSEN with its tube 2 mm in cross-section, wall thickness of 0,2 mm, and dense transverse striae extending along the entire length of the tube.

D e s c r i p t i o n : Tubular ball irregularly coiled in plane, length of coiled tube about 55 mm. Tube striation denser anteriorly. Aperture circular, funnel — shaped. Two incomplete tabulae occur irregularly in the posterior part of the tube; lumen tapers sharply.

The tube is not covered posteriorly by a ball as in the other species of the genus *Glomerula* NIELSEN, but is S-shaped.

The deepening of the funnel-shaped aperture widened by 0,3 mm transverse striae made in two cases. Two opposite inner longitudinal striae can be observed at the apertures and range from 3 to 5 mm in length.

R e m a r k s a n d r e l a t i o n s : *G. nuntia* n. sp. is as yet the only species of the genus *Glomerula* NIELSEN that bears sculpture.

It is rather less abundant at both established localities; four specimens have been found attached to oyster shells.

Stratigraphical range and localities in the Bohemian Cretaceous: Lo-

wer Turonian — Běstvína near Ronov, Turkaň near Kutná Hora.

Glomerula scitula REGENHARDT, 1961

(Pl. I, Fig. 7)

1961 *Glomerula scitula* n. sp. — H. REGENHARDT: Serpulidae..., p. 27, Pl. 1, Fig. 1.

Holotype: Geol. Staatsinst. Hamburg, Typ. Kat. No. 712

Type horizon: Upper Maastrichtian

Type locality: Hemmoor, Niedersachsen.

Material: Fourteen complete specimens and 56 fragments of various tubular parts. Specimens have always been found to live free, in no one case attached to objects lying on the sea bottom.

Description: Minute, smooth tube coiled irregularly. Aperture hidden. Tube cross-section always circular as is also the transverse section of the lumen. Tube diameter ranges from 0,28 to 0,6 mm. Wall thickness regular. Lumen of uniform diameter throughout its length and averages 0,3 mm in size (0,09—0,47). Tube is folded in ball centre and bears 1 true table together with 3 to 5 incomplete tables. Tube length is about 30 mm and never exceeds 50 mm.

Remarks and relations: Of all the hitherto known species of the genus *Glomerula* NIELSEN, *G. scitula* REGENHARDT displays the smallest tube diameter. In contrast to the other generic members, this specimen has no untrue tables in the tubular central part.

H. REGENHARDT (1961) reported the species from the Chalk (Upper Maastrichtian) of Germany. It also occurs in the surf zone of the Bohemian Cretaceous, though in small members. It thus became possible to extend the species biozone from the Turonian into the Maastrichtian.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Běstvína near Ronov, Kaňk, Předboj, Starkoč, Velim (Skalka), Zbyslav No 51.

Glomerula solitaria REGENHARDT, 1961

(Pl. I, Fig. 8, 9)

1961 *Glomerula solitaria* n. sp. — H. REGENHARDT: Serpulidae..., p. 28, Pl. 9, Fig. 11

Holotype: Geol. Staatsinst. Hamburg, Typ. Kat. No 713

Type horizon: Campanian

Type locality: Lägerdorf (Holstein)

Material: Eleven incomplete specimens and 39 fragments of various tubular parts. One incomplete specimen attached to brachiopod shell. Tube surface much corroded chemically in some specimens.

Descriptions: Circular tube forming irregularly pyramidal balls. Aperture always open, of funnel-shape type. Diameter of transverse tube cross-section varies between 1,9 and 2 mm. Circular lumen of irregular size due to variation in wall thickness (0,2—0,4 mm). Indications of 4 incomplete tabulae can be seen at irregular intervals in the tube middle part. Tube is clearly thinner in the posterior than in central and anterior parts, and is smooth with no sculpture.

Remarks and relations: *G. solitaria* REGENHARDT may be

ranked amongst the largest Cretaceous species of the genus. It may be distinguished from a roughly equally sized species, *G. nuntia* n. sp., by its tube having smooth surface.

The biozone of this species as reported by H. REGENHARDT (1961) from the Campanian can also be extended because it was certainly established in Turonian sediments of the Bohemian Cretaceous.

Species members never form larger colonies and can be found as individuals mostly attached to organic substratum. The posterior part of the tube usually was very weakly attached to the substratum and can frequently be found dissociated from the other tubular parts.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Kamajka, Předboj, Starkoč, Velim (Skalka).

Genus *Protula* RISSO, 1826

Protula planianica nov. spec.

(Pl. II, Fig. 2, 3)

H o l o t y p e: Specimen No 01733, the National Museum in Prague, designated on the Pl. II. fig. 2, 3

T y p e h o r i z o n: Lower Turonian

T y p e l o c a l i t y: Plaňany, Kolín district; a hollow spot of the road at the railway station at Plaňany, some 130 m east of the latter.

D e r i v a t i o n o f n a m e: After *planianica* (Lat.) = *plaňanská* — a Czech adj.; the type locality Plaňany

M a t e r i a l: Two complete specimens and 36 fragments of various tubular parts. Ninety percent of the tubes is cemented in calcareous-sandy marlstone (type locality) or organodetrital limestone. The four fragmentary moulds coming from the Markovice locality are spatially contorted (82 percent).

D i a g n o s i s: A species of the genus *Protula* RISSO, the tube diameter of which varies from 9 to 10 mm. Tube surface bears a distinct but irregularly transverse sculpture.

D e s c r i p t i o n: Relatively long (up to 150 mm), uncoiled, irregularly curved (undulose) tube of circular cross-section. The posterior tubular part is attached inorganic substratum while its other parts are unattached to it. Cellular layers serpulid weakly developed posteriorly, but firmly attach the tube to the substratum. Aperture funnel-shaped. Tubular cross-section diameter never exceeds the size mentioned above. Lumen size (8,3—8,7 mm) invariable in middle and anterior parts but decreases posteriorly so as to make the lumen completely taper. Tube wall thickness up to 0,6 mm. Tube thin-walled. Indications of as much as 7 incomplete tabulae can be seen in the middle part of the tube, whereas one complete tabula of extremely small thickness (0,3 mm) is located posteriorly. Tube surface bears irregular, fine but distinct sculpture; only tubular folds display coarser sculpture; and sculpture is missing in the posterior part of the tube.

R e m a r k s a n d r e l a t i o n s: *Protula planianica* n. sp. is the largest and the only species of the genus found in sediments of the Bohemian Cretaceous.

Serpula conjuncta GEINITZ is similar to it, but may be distinguished by

a larger diameter of its tube cross-section and the more prominent sculpture, both transverse and longitudinal. Moreover, it is attached to the substratum along its entire tube length.

Stratigraphical range and localities in the Bohemian Cretaceous: Upper Cenomanian — Markovice, Plaňany (left side of the quarry); Lower Turonian — Čáslav (Na Svornosti), Nová Ves near Kolín, Plaňany (the quarry's road), Radim near Pečky, Velim (Skalka).

Genus *Sarcinella* REGENHARDT, 1961

Sarcinella socialis (GOLDFUSS, 1831)

(Pl. 2, Fig. 7, 8)

1831 *Serpula socialis* n. sp. — A. GOLDFUSS: Petrefacta, p. 235, Pl. 69, Fig. 12

1845 *Serpula filiformis* — REUSS. Böhm, Kr. I, p. 20, Pl. 5, Fig. 26

1934 *Serpula socialis* — ANDERT: Kr. Elbe Je, p. 78, Pl. 19, Fig. 11

1961 *Sarcinella socialis* (GOLDFUSS) — H. REGENHARDT: Serpulidae, pp. 29—30, Pl. 1, Fig. 5

L e c t o t y p e : Specimen No. 716, Geol. Staatsinst. Hamburg, designated by H. REGENHARD (1961) on the Pl. 1, Fig. 5

M a t e r i a l : Three hundred and sixty-seven fragmentary bundles coming from various localities in the Bohemian Cretaceous and forming 95 percent a cement of the rock. Signs of mechanical or chemical disturbance of the tubes are visible.

D e s c r i p t i o n : Small, marscopically circular tubes united so as to form bundles. The number of the tubes in bundles is highly variable. The bundles produce cords showing various dichotomization. Megascopically the tubes are irregularly curved in transverse cross-section, but the lumen retains its circular shape. Transverse diameter of the tube cross-section ranges from 0,5 to 1 mm; lumen diameter varies between 0,4 and 0,9 mm. Walls are thin, not exceeding 0,16 mm. Calcite occurs as the cementing medium between the tubes to strengthen their walls. Tube length as much as 90 mm. Lumen is of uniform size along the entire length of the tube but sharply tapers at the end of the posterior part. Right tabula developed posteriorly, but incomplete tabulae (1 to 2) occur quite exceptionally in the middle part of the tube. Tube surface smooth, with no sculpture. Aperture funnel-shaped.

R e m a r k s a n d r e l a t i o n s : The species occurs in great numbers in calcareous-sandy sediments of Middle Turonian age in the Bohemian Cretaceous. Commonly found outside the Bohemian Cretaceous at levels other than the Middle Turonian, this distinct congregative worm is exclusively restricted to the Middle Turonian in the sediments of the Bohemian Cretaceous Basin (V. ZIEGLER — 1978).

S. plexus (SOWERBY) is very similar to it, but may be distinguished especially by short and intermingled bundles. S. WARE (1975) united both specimens to form one species, irrespective of the shape and size of the bundles and the kinds of intermingled as well as interconnected tubes. Moreover, the two species differ from each other tube size and the formation of tabulae, the last-named character being lacking in *S. plexus* (SOWERBY).

Stratigraphical range and localities in the Bohemian Cretaceous: Middle

Turonian — Benátky n. Jizerou, Brandýs n. Orlicí, Čejtice, Česká Lípa, Česká Třebová, Dolánky near Turnov, Choceň, Klokočské Loučky, Kokoříň, Libuň, Litomyšl, Muzlov near Svitavy, Rovensko p. Troskami, the Svitavy area, the Mladá Boleslav area, Turnov, Vápeník near Turnov, Libuň, Železnice.

Sarcinella plexus {SOWERBY, 1829}

Pl. II, Fig. 6)

1829 *Serpula plexus* J. de SOWERBY: The Mineral, p. 201, Pl. 598, Fig. 1

1975 *Sarcinella plexus* S. WARE: Lover Greensand, p. 113, Pl. 20, Fig. 1

Lectotype: Specimen shown J. de SOWERBY (1829) on the Pl. 598, Fig. 1..

Material: Seventeen free fragmentary part of bundles not cemented in the rock.

Description: Small, circular tubes visible both macroand microscopically, irregularly intermingled so as to form bundles. Bundles do not produce cords. Length of bundles and tubes up to 36 mm. Diameter of tube transverse cross-section is invariable, attaining 1,2 mm. Lumen diameter nearly 0,9 mm. Lumen of invariable size in its anterior and middle parts, becoming narrower but not tapering posteriorly. The number of tubes in one bundle varies between 7 and 11. Tubes with smooth surface. Aperture funnel-shaped. No tabular have been observed.

Remarks and relations: The species is fairly common in the surf area of the Bohemian Cretaceous; it occurs rather rarely in deeper sedimentary environments, being limited to sandy facies.

S. WARE (1975) was correct in uniting *Sarcinella sarcinella* REGENHARDT (1961) with *S. plexus* {SOWERBY}, but the specimen *S. socialis* {GOLDFUSS} he made conspecific with the latter is a separate species, as is also *S. plexus* {SOWSRBY} (cf. the reasoning for *S. socialis*). In addition the examined species does not surpass he between the Lower and Middle Turonian in the Bohemian Cretaceous.

Stratigraphical range and localities in the Bohemian Cretaceous: Upper Cenomanian — the surroundings of Moravská Třebová; Lower Turonian — Kaňk, Kamajka, Nová Ves near Kolín, Radim near Pečky, Předboj.

Sarcinella minor nov. spec.

(Pl. II, Fig. 4, 5)

Holotype: Specimen No 0 5156, Collection of V. Ziegler, in the National Museum in Prague, designated on the Pl. II, Fig. 4.

Type horizon: Lower Turonian.

Type locality: Velim — Skalka.

Derivation of name: After minor (Lat.) — small; general species habit.

Material: Two complete specimens and 5 fragments coming from various parts of a bundle. Specimens are not cemented in the rock.

Diagnosis: A species of the genus *Sarcinella* REGENHARDT containing a regular number of tubes in one bundle (3) and having a small diameter of the tube transverse cross-section (0,2—0,4 mm).

Description: Minute, megascopically rounded tubes, but flattened microscopically at their contact; length does not exceed 10 mm. Tubes spiral-coiled, though almost imperceptibly in some specimens. Lumen diameter ranges from 0,1 to 0,3 mm. Lumen retains its invariable size along the entire length of the tube. No tabular can be seen.

Tubes bear a transverse sculpture consisting of striae and ridges in their anterior and middle parts. Sculpture is variable in both numbers and size, becoming weaker posteriorly. Tube is smooth in the posterior direction. Aperture simple, funnel-shaped.

Remarks and relations: *S. minor* n. sp. is the smallest species of the *Sarcinellae* found in the Bohemian Cretaceous and nor can it be compared with the other fossil species. It bears resemblance to the recent genus *Salmacina* CLAPARÉDE on account of its spiral-coiled tubes, but the latter possesses circular tubes and their number in the bundles is much greater and more variable.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Velim—Skalka, Vítězov, Nová Ves near Kolín, Bášt.

Genus *Jereminella* LUGEON, 1919

Jereminella spinari nov. spec.

(Pl. II, Fig. 1)

Holotype: Specimen No 05169, Collection of V. Ziegler in the National Museum in Prague, designated on the Pl. II, Fig. 1.

Type horizon: Upper Turonian.

Type locality: Liběšice near Bílina (quarry at the southwest margin of the village).

Derivation of name: After Prof. Dr. Z. V. Špinar, an eminent Czech Paleontologist.

Material: Two complete specimens and 6 fragments coming from various parts of the tube. The tubes have been found cemented in calcareous sandy marlstone and their removal would make the complete specimens damaged because would make the tubes are decalcified and highly freeable.

Diagnosis: A species of the genus *Jereminella* LUGEON with a transverse diameter of 1,9—2 mm. Sculpture is prominent.

Description: Tube long, circular both mega- and microscopically. Lumen size about 0,5 mm. No tabular have been found. Sculpture consisting of thick ridges extending along the entire tube length. Also discernible are the simple and thin transverse ligaments which terminate without reaching the posterior part of the tube. Only one fragment has been found to display transverse sculptural elements passing into the posterior part just mentioned, although the latter is not completely covered with transverse sculpture. Tube length is about 50 mm.

Remarks and relations: H. REGENHARDT (1961) discusses in his paper the relationships of the genus *Jereminella* LUGEON to the recent genus *Terebellina* ULRICH. Similar comparisons have also been made by A. SEILACHER (1953), who compared ecological conditions created for both genera. *J. spinari* n. sp. lived in somewhat different condi-

tions than the other generic members. Although its ecological environment much resembled that of species belonging to the genus *Terebellina* ULRICH, it is apparent that *J. spinari* n. sp. can rightfully be ranged to serpulids. It is the inner structure of its tube wall which undoubtedly proves its placing in the family *Serpulidae* BURMEISTER. Especially well discernible is the outer, parabolical tube layer typically occurring in serpulids.

Stratigraphical range and localities in the Bohemian Cretaceous: Upper Turonian — Liběšice near Bílina, Čížkovice, Vinařice.

Subfamily *Serpulinae* RIOJA, 1925

Genus *Serpula* LINNAEUS, 1758

Serpula antiquata SOWERBY, 1829

(Pl. III, Fig. 1)

1829 *Serpula antiquata* n. sp. — J. SOWERBY, The Mineral, p. 202, Pl. 568, Fig. 4

1961 *Parsimonia antiquata* (SOWERBY) — H. REGENHARDT, Serpulidae, p. 39

H o l o t y p e : Specimen designated on the Pl. 598, fig. 4 — J. SOWERBY, 1829.

T y p e h o r i z o n : Lower Cretaceous.

T y p e l o c a l i t y : England.

M a t e r i a l : Seven incomplete specimens and 31 fragments of various parts of tube. One complete specimen has been found grown on the mollusc *Exogyra sigmoidea* REUSS. Tube fragments are much damaged mechanically.

D e s c r i p t i o n : Tube loop-shaped, attached along its entire ventral side. Cellular layers are strong and firmly attach the tube to its substratum. Tube transverse cross-section circular in outline.; diameter ranges from 2,7 to 3,3 mm. Lumen circular, its diameter varying between 1,9 and 2,1 mm. Wall thickness as much as 0,6 mm. Two tabulae developed in the posterior part of the tube; no incomplete tabulae occur in its middle part. Indistinct and transverse rings can be seen on the anterior and middle surface of the tube. Posterior part smooth. The tube strikingly narrows posteriorly and its aperture is funnel-shaped. Tube length ranges from 36 to 46 mm.

R e m a r k s a n d r e l a t i o n s h i p s : H. REGENHARDT (1961) changed the existing genus *Serpula* LINN. to a new genus, *Parsimonia* in which he also placed the species described above. Unfortunately, he overestimated the systematic significance of the tube sculpture the recent genus *Serpula* shows a much higher sculptural variability, thanis the sculptural difference between the fossil genera *Serpula* and *Parsimonia*. For these reasons the present author reassigns the species *antiquata* again to the genus *Serpula* LINNAEUS.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Kamajka, Kaňk, Předboj, Velim — Skalka, Zbyslav No 51; Middle Turonian — Dolánky near Turnov, Hledsebe near Mělník, Klokočské Loučky, Kokořín, Libuň, Turnov, Zvířetice.

Serpula conjuncta GEINITZ, 1846

(Pl. III, Fig. 2)

1846 *Serpula conjuncta* n. sp. — H. B. GEINITZ: Grundriss..., p. 250, Pl. 16, Fig. 20

Holotype: Specimen designated on the Pl. 16, Fig. 20 — H. B. GEINITZ (1846).

Type horizon: Cretaceous.

Type locality: Germany.

Material: Sixty-two fragments of various tubular parts, of which 12 have been found cemented in the rock. Tubes consisting of calcitic material and their surface is damaged mechanically and spatially on only some of the fragments.

Description: Thick, irregularly tortuous and intermingled tube attached along its entire length to the substratum. Tube circular in transverse cross-section, as is also lumen. Cellular layers of serpulids weakly developed. Diameter of tube and lumen ranges from 13 to 17 mm and from 12 to 14 mm, respectively. Wall thickness varies between 0,9 and 1,2 mm. Lumen becomes somewhat narrower posteriorly without tapering sharply, and forms a rounded closure. Four tabular of extremely small thickness are present. No incomplete tabulae have been observed.

The parabolic structure of the outer parabolic tubular layer is often replaced by transverse lamellae. Tube surface with strong sculpture. Transverse striae and ridges are particularly prominent. Transverse sculptures are less distinct posteriorly. Longitudinal sculptures form four, V-shaped striae which terminate without reaching the posterior part of the tube. Aperture funnel-shaped.

Remarks and relationships: *S. conjuncta* GEINITZ resembles the recent species *S. vermicularis* LINNAEUS in its tube structure, but the latter possesses tubes of greater thickness. The specimen under description is also similar to *Protula planianica* n. sp. with it has also been found associated. The two species differ from each other especially in the sculpture (which is more distinct in *S. conjuncta* GEINITZ) and in the mode of attachment of the tube to the substratum (found along its entire length in *S. conjuncta* GEINITZ).

Serpula conjuncta GEINITZ coming from the Bohemian Cretaceous typically occurs in marine Cenomanian sediments, particularly in sandy, marly-sandy and marly facies close to characteristic surf sediments.

Stratigraphical range and localities in the Bohemian Cretaceous: Upper Cenomanian — Bášf, Bílina, Brázdím, Holubice, Kojetice, Miskovice, Mezholezy, Radovesnice, Šilinky near Bílina, Plaňany.

Serpula prolifera GOLDFUSS, 1831

(Pl. III, Fig. 3)

1831 *Serpula prolifera* n. sp. — A. GOLDFUSS: Petrefacta, p. 231, Pl. 68, Fig. 11

1956 *Serpula (Tetraserpula) prolifera* GOLDFUSS — K. O. A. PARSCH; Die Serpuliden — Fauna, p. 226, Pl. 19, Fig. 18

Holotype: Specimen designated on the Pl. 68, Fig. 11 — A. GOLDFUSS (1831).

Type horizon: Turnonian.

Type locality: Germany.

Material: Six complete specimens and 57 fragments of the central or anterior part of the tube. Fragments are free, 90% having a more or less damaged sculpture.

Description: Slightly bent tube attached to the substratum along its entire length. Cellular serpulid layers form a straight tube base. In the dorsal part of the tube run two longitudinal ridges continuing into the posterior part. The tube is swollen anteriorly as compared to its other parts. Aperture enlarged, but corresponds to the "funnel-shaped" type. Ridges and base give the impression that the tube is quadrangular in its oblique outline. Lumen circular, with a diameter ranging from 0,5 to 0,7 mm in single specimens. Tube diameter within the limits of 0,9—1 mm. Wall thickness as much as 0,2 mm. Lumen becomes narrower toward the posterior part of the tube and ultimately sharply tapers. Two thin tabulae visible posteriorly. A strong transverse sculpture forming transverse ridges is also developed.

Remarks and relationships: *S. prolifera* GOLDFUSS is a serpulid characteristically occurring in facies of sandy calcareous conglomerate and clay organodetrital limestone and is usually accompanied by the species *Pomatoceros biplicatus* (REUSS).

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Běstvina, Kamajka, Kaňk, Kutná Hora — Turkaňk, Nová Ves near Kolín, Předboj, Radim, Starkoč, Velim — Skalka, Vítězov, Zbyslav and Žehušice.

Serpula rauca nov. spec.

(Pl. III, Fig. 4, 5)

Holotype: Specimen No. 01735 Coll. National Museum of Prague designated on the Pl. III. Fig. 4, 5.

Type horizon: Lower Turonian (I. labiatus Zone).

Type locality: Zbyslav near Čáslav, No. 51.

Derivation of name: *rauca* (Lat.) — rugged; after deep striae running ventrally and making the tube rugged.

Material: One nearly complete specimen and 7 additional fragments representively from various tubular parts.

Diagnosis: A species of the genus *Serpula* LINNAEUS with deep, transverse, V-shaped striae seen in the tubular folds.

Description: Small, loop-shaped tube with circular cross-section, which is very weakly attached to its substratum. Cellular layers of serpulids weakly developed. Tube lumen circular in cross-section and 0,6—0,75 mm in size. Diameter of tube transverse cross-section ranges from 0,9 to 1 mm. Wall thickness about 0,06 mm. Tube length nearly attains 17 mm in two specimens. Lumen narrowing posteriorly so as to wedge out. Three tables of very small thickness can be seen. There is an irregular number of incomplete tabulae in the middle part of the tube. Tube surface bears strong sculpture especially on the ventral side.

In particular, transverse sculpture forming deep, V-shaped striae can be observed. Longitudinal sculptures are only represented by a low ridge terminating in the middle part. Aperture funnel-shaped.

Remarks and relationships: *Serpula rauca* n. sp. belongs to small types of the genus *Serpula* LINNAEUS. It may be distinguished from the other species of the genus especially by its deep striae extending on the ventral side and well visible laterally.

Another interesting feature of *S. rauca* n. sp. is the formation of incomplete tabulae in the middle part of the tube. Their formation begins with an imperceptible swelling of the inner tube layer so that the excess material forming the laminar layer is gradually being deposited at various places of the tubular middle part unless, and until, the tubercle representing an incomplete is thus formed.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Starkoč, Zbyslav No 51, Zbyslav.

Genus *Spiraserpula* REGENHARDT, 1961

Spiraserpula spirographis (GOLDFUSS, 1831)

(Pl. III, Fig. 6, 7)

1831 *Serpula spirographis* n. sp. — A. GOLDFUSS: Petrefacta, p. 239, Pl. 70, Fig. 17

1955 *Serpula spirographis* GOLDFUSS — W. J. SCHMIDT: Die Tertieren, p. 63, Pl. 6, Fig. 24

1961 *Spiraserpula spirographis* (GOLDFUSS) — H. REGENHARDT: Serpulidae, p. 43

Holotype: Specimen designated on the Pl. 70, Fig. 17 — A. GOLDFUSS (1831).

Type horizon: Cenomanian.

Type locality: Grünsand, Essen.

Material: Three complete specimens and 47 fragments of various tubular parts. Seven fragments of the tubular spiral posterior part lay on oyster shells. Spatially contorted (50 %).

Description: Minute tube, circular in transverse cross-section. Tube planispirally coiled posteriorly. Spiral coils interconnected by means of fine calcitic mass. Middle and anterior parts of the tube loop-shaped. Tube attached along its entire length to the substratum; the diameter of its transverse cross-section varies between 0,8 and 1 mm. Lumen circular, 0,6—0,7 mm in diameter, and narrows posteriorly towards the tube, but does not wedge out as it forms a rounded closure. Two tabulae can be seen posteriorly. Tubular thickness equals that of the inner (laminar) tube layer. Tube wall thickness is 0,2 mm, but exceptionally may attain as much as 0,4 mm. Incomplete tabulae undeveloped. Tube smooth, without any sculpture. Aperture funnel-shaped.

Remarks and relationships: *Spiraserpula spirographis* (GOLDFUSS) shows closest affinities to the species *S. subinvoluta* (REUSS), but the posterior part of the latter is not developed planispirally but forms a low cone.

S. spirographis (GOLDFUSS) always occurs at a locality in greater numbers of specimens.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Kamajka, Předboj, Sobčice, Velim — Skalka, Zbyslav No 51, Zbyslav.

Spiraserpula subinvoluta (REUSS, 1845)

(Pl. III, Fig. 8)

1845 *Serpula subinvoluta* n. sp. — A. REUSS: Die Versteinerungen, p. 19, Pl. 5, Fig. 27

1893 *Serpula subinvoluta* REUSS — A. FRÍČ: Studien, pp. 61 and. 109

1961 *Serpula subinvoluta* REUSS — H. REGENHARDT: Serpulidae, p. 3-

H o l o t y p e: Specimen designated on the Pl. 5, Fig. 27 — A. E. REUSS (1845).

T y p e h o r i z o n: Upper Turonian — marlstone.

T y p e l o c a l i t y: Obora near Louny.

M a t e r i a l: Seven complete specimens, 26 fragments consisting of the posterior parts of the tube, and additional 30 fragments representing various tubular parts. Fragments are spatially contorted (40 %).

D e s c r i p t i o n: Small tube, circular in transverse cross-section. Posterior part of the tube coiled so as to form a low cone with firmly interconnected coils. The tube becomes straightened in its middle and anterior parts and is attached to the substratum along its length. Cellular serpulid layers weakly developed. Transverse cross-section diameter never exceeds 1,2 mm. Lumen circular, its diameter attaining as much as 0,8 mm, and becomes narrower posteriorly but does not taper sharply. Wall thickness 0,1—0,2 mm. Two tabulae of very small thickness developed in the posterior tubular part. Incomplete tabulae undeveloped. Sculpture consisting of very weak, transverse striae developed only anteriorly and at the beginning of the middle part. Longitudinal sculpture undeveloped. Tube length as much as 12 mm. Aperture funnel-shaped.

R e m a r k s a n d r e l a t i o n s h i p s: H. REGENHARDT (1961) ranged the species to the genus *Serpula* LINNAEUS but, as stated by himself, the paucity of material made an examination of this specimen impossible. After examining my own material in great detail, I have reached the conclusion that those species having a low conical spiral in the posterior tubular part must be placed in the genus *Spiraserpula* REGENHARDT because they have some important features in common with the latter. These features are as follow; the the structure of the outer tube layer is not parabolic; the posterior tubular part forms a spiral whose coils are firmly interconnected; tube sculpture is weakly developed; and incomplete tabulae are undeveloped.

S t r a t i g r a p h i c a l r a n g e a n d l o c a l i t i e s i n t h e B o h e m i a n C r e t a c e o u s: Lower Turonian — Předboj, Sobčice near Ostroměř; Middle Turonian — Dolánky near Turnov, Hledsebe near Mělník, Klokočské Loučky, Mladá Boleslav, Vápeník near Turnov, Turnov — Farářství, Zvířetice; Upper Turonian — Čížkovice, Lužice near Bílina; Coniacien — Březno near Louny.

Genus *Martina* nov. gen.

T y p e s p e c i e s: *Martina martina* nov. spec.

D e r i v a t i o n o f n a m e: After euphonious combination of sounds.

D i a g n o s i s: A genus of the family *Serpulidae* BURMEISTER. Smooth tubes, circular in cross-section. Tube consisting of two or three coils superposed one upon another and not interconnected by means of cellular layers of serpulids.

Description: Transverse cross-section of tube 0,2—1,4 mm. The size of the lumen and wall thickness remain invariable in the two species so far found. Lumen of invariable diameter nearly along the entire tube length; only close to the end of its posterior part does it become slightly narrower and ultimately arcuate. Aperture funnel-shaped, being either at the level of or imperceptibly raised above the last coil.

Remarks and relationships: The newly described genus *Martina* nov. gen. is intermediate between the species *Spiraserpula* REGENHARDT and *Omasaria* REGENHARDT, on the one hand, and the genus *Cementula* NIELSEN on the other. In the genus *Martina* n. gen. it is possible to observe tube coils lying one on top of the other, but these are not firmly interconnected by means of cellular serpulid layers as can be seen in the genus *Cementula* NIELSEN (K. B. NIELSEN, 1931, H. REGENHARDT, 1961). These cellular layers only form a well discernible rim on the preceding coil.

Two species, *M. martina* n. sp. and *M. parva* n. sp., have been found in the Lower Turonian of the Bohemian Cretaceous.

Martina martina nov. spec.

(Pl. IV, Fig. 1, 2)

Holotype: Specimen No 0 5165 Coll. V. Ziegler, in the National Museum in Prague, designated on the Pl. IV, Fig. 1, 2.

Type horizon: Lower Turonian.

Type locality: Velim — Skalka (pocket Václav).

Derivation of name: Ibid genus.

Material: Two complete specimens and 6 fragments mostly representing anterior and middle parts of the tube.

Diagnosis: A species of the genus *Martina* nov. gen. with a tube containing two and a half coils. Coils superposed upon one and not firmly interconnected.

Description: Smooth tube a transverse cross-section ranging from 1,2 to 1,4 mm. Wall thickness 0,2 mm. Lumen transverse cross-section 0,8—1 mm. Tube coils are not firmly interconnected by means of cellular layers of serpulid which cover as much as one-fourth of each subjacent coil and visually rim the upper border of the tube. The layers rise above the coil level and thus virtually compose a single though untrue sculpture of the tube. In the posterior part there is one true tabula, the thickness of which equals wall thickness. Aperture at coil level, funnel-shaped.

Remarks and relationships: The only species similar to *M. martina* n. sp. and found in the Bohemian Cretaceous is *M. parva* n. sp. *M. martina* n. sp. may clearly be distinguished especially by its size and the localition of the aperture; *M. parva* is much smaller in size and its aperture slightly rises above the coil level.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Velim - Skalka, Starkoč, Zbyslav No 51.

Martina parva nov. spec.

(Pl. III, Fig. 9)

Holotype: Specimen No 0 5171. Coll. V. Ziegler, in the National Museum in Prague, designated on Pl. III, Fig. 9.

Type horizon: Lower Turonian.

Type locality: Předboj — pocket Pavel.

Derivation of name: Parva (Lat.) — small minute; after the species size.

Material: Six complete specimens removed from the rock, of which 5 fragments are cemented in the rock.

Diagnosis: A species of the genus *Martina* n. gen. with smooth tube forming 3 coils; diameter of tube transverse cross-section 0,4 mm.

Description: Smooth tube with 3 coils lying one upon the other and not firmly interconnected. Cellular serpulid layers do not form a rim similar to that seen in *Martina martina* n. sp. Lumen diameter 0,2 mm; wall thickness 0,1 mm. Lumen of invariable diameter throughout its length and finally becomes rounded posteriorly. Two true tabular 0,1 mm thick are developed posteriorly. No incomplete tabulae have been observed. Aperture funnel-shaped and imperceptibly rises above the coil.

Remarks and relationships: The relationship between both species of the genus *Martina* n. gen. has been discussed in the part on *Martina martina* n. sp.

Contrary to *M. martina* n. sp., *M. parva* n. sp. occurs in the surf area west of Prague. Both species have been found to lead a free mode of life; no attachment to the shells of other animals has so far been observed.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Předboj — pocket Pavel.

Genus *Mucroserpula* REGENHARDT, 1961

Mucroserpula arcuata (MÜNSTER, 1831)

(Pl. IV, Fig. 3, 4)

1831 *Serpula arcuata* MÜNSTER — A. GOLDFUSS: Petrefacta, p. 237, Pl. 70, Fig. 10

1939 *Serpula arcuata* MÜNSTER — E. DACQUÉ: Regensb., p. 33

1961 *Mucroserpula arcuata* (MÜNSTER) — H. REGENHARDT: Serpulidae, p. 48, Pl. 4, Fig. 3

Holotype: Specimen designated on the Pl. 70, Fig. 10 — A. GOLDFUSS, 1831.

Type horizon: Cenomanian.

Type locality: Regensburg.

Material: Twenty-one fragments of various part of the tube, of which 18 are anterior or middle partous. All fragments removed from the rock.

Description: The tube forms one coil, its posterior part either being covered with aperture or encompassing it on the outer side of the coil.

Transverse cross-section of tube pentagonal. Diameter of transverse cross-section 4—4,6 mm. Lumen circular, sharply wedging out posteriorly. Diameter of lumen transverse cross-section ranges 2—2,2 mm. Tube wall thickness 0,9—1,1 mm. Tube with a prominent longitudinal sculpture forming the ridge stretching along its entire length. On either side of the ridge there are shallow striae extending along the whole tube length.

Among transverse sculptures irregular ridges also visible throughout the tube length are particularly prominent, increasing in size anteriorly and especially at the aperture. There are also shallow transverse striae extending anteriorly, but their number is ming the ridge running dorsally, as well as by lateral walls.

Remarks and relationships: Unlike the other species from the Bohemian Cretaceous, *M. arcuata* (MÜNSTER) has a ridge on its dorsal side.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Velim — Skalka, Zbyslav No 51.

Mucroserpula mucroserpula n. sp. — H. REGENHARDT, 1961

(Pl. IV, Fig. 5)

1961 *Mucroserpula mucroserpula* n. sp. — H. REGENHARDT. *Serpuli dae*, pp. 47, 48, Pl. 4, Fig. 2

Holotype: Geol. Staatsinst. Hamburg, Typ. Kat. No. 732.

Type horizon: Hauterivian.

Type locality: Schandelah, Niedersachsen.

Material: Four fragments of various tubular parts.

Description: Tube with oval to quadrangular cross-section, 15 to 22 mm long. Diameter of tube transverse cross-section 2—2,2 mm. Lumen of circular cross-section, its diameter at the aperture ranging from 1,6 to 1,9 mm and wall thickness attaining a value of about 0,2—0,3 mm. A prominent longitudinal sculpture is the stria which turns to ridge in the middle and posterior parts. Transverse ridges are also distinct, particularly on the anterior side of the tube, close to the aperture. On prominent tubercle, an indentation (a tooth), can be seen in the aperture.

Remarks and relationships: Owing to the paucity of material, it became impossible to obtain data not provided even by H. REGENHARDT (1961) on the number and thickness of true tabulae, the formation of incomplete tabulae (as these have not been observed on the material available), and the thinning out as well as shape of the lumen on the posterior tubular side.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Velim - Skalka, Zbyslav No 51.

Mucroserpula velimia nov. spec.

(Pl. IV, Fig. 6)

Holotype: Specimen No 05168. Coll. of V. Ziegler, in the National Museum in Prague, designated on the Pl. IV, Fig. 6.

Type horizon: Lower Turonian.

Type locality: Velim — Skalka.

Derivation of name: Velimia, after the type locality.

Material: One specimen without the posterior tubular part, 2 specimens without the anterior part, and 6 fragments representing various tubular parts. Fragments are spatially contorted.

Diagnosis: A species of the genus *Mucroserpula* REGENHARDT, with its tube diameter attaining 12 mm at the aperture.

Description: A gigantic tube 70 to 90 mm long. Lumen circular, becomes narrower toward the posterior part of the tube, and is not terminated sharply but is rounded. Its diameter is 9 to 12 mm at the aperture; wall thickness varies between 1,5 and 1,7 mm. In the posterior tubular part two incomplete tabulae are variably apart in the examined specimens. A longitudinal stria runs dorsally along the entire tube length and grades into transverse low and wide ridges irregularly distributed over the whole tube. Aperture dentate, with one prominent tooth on the dorsal tubular side.

Remarks and relationships: *M. velimia* n. sp. is known only from two localities. Its gigantic tubes can be confused with those of *Serpula conjuncta* (GEINITZ) with which it can be found associated at the Velim locality. However, *S. conjuncta* (GEINITZ) has no longitudinal stria but possesses much stronger serpulid cellular layers which are almost lacking in the species *M. velimia* n. sp.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Radim near Pečky, Velim — Skalka.

Genus *Pomatoceros* PHILIPPI, 1844

Pomatoceros ares nov. spec.

(Pl. IV, Fig. 7, 8)

Holotype: Specimen No. 0 1734 Coll. in the National Museum in Prague, designated on the Pl. IV, Fig. 7, 8.

Type horizon: Lower Turonian.

Type locality: Velim — Skalka.

Derivation of name: Ares, after the dorsally extending ridge that resembles a crest worn on Ares' helmet (Roman god of war).

Material: Twenty-two fragments of various tubular parts not cemented in the rock.

Diagnosis: A species of the genus *Pomatoceros* PHILIPPI with a high ridge extending dorsally on the tube.

Description: An almost straight tube attached along its entire length to the substratum by means of thin serpulid layers. Tubular sculpture consist of irregular transverse striae, longitudinal U-shaped striae terminating in the middle part, and of a high longitudinal ridge. This ridge is as much as 4 mm high anteriorly and corrugated at irregular intervals. Tubular transverse cross-section is triangular in outline; lumen circular and 2,2 to 2,4 mm in size. Wall thickness 0,41—0,43 mm. Lumen narrows posteriorly and ultimately sharply tapers just in the posterior part. Neither true nor incomplete tabulae have been observed. Aperture funnel-shaped. Tube length varies between 37 and 45 mm.

Remarks and relationships: *P. ares* n. sp. clearly differs from the other species of the genus *Pomatoceros* PHILIPPI in its dorsal ridge extending along the entire tube length.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Kamajka, Kaňk, Starkoč, Velim — Skalka, Zbyslav.

Pomatoceros biplicatus (REUSS, 1845)

(Pl. IV, Fig. 9)

1845 *Serpula biplicata* n. sp. — A. E. REUSS: Die Versteinerungen

Holotype: Specimen designated A. E. REUSS (1845), p: 20, Pl. 5, Fig. 26.

Type horizon: Lower Turonian.

Material: Twenty-seven fragments of various tubular parts, either free or attached (7 specimens) to various oyster species.

Diagnosis: A species of the genus *Pomatoceros* PHILIPPI with twice S-shaped tube and thick serpulid layers.

Description: Tube with typical triangular cross-section. Sculpture consisting of fine transverse striae in the anterior and middle parts of the tube. Tube surface is smooth posteriorly and its length attains up to 50 mm in some specimens. Lumen circular, becoming narrower posteriorly, and ultimately its wedges out. In the posterior part there is one true tabula as thick as the wall. Diameter of tubular transverse cross-section at the aperture attains 1,1–1,7 mm. Wall thickness 0,3–0,4 mm. Aperture funnelshaped.

Remarks and relationships: *P. biplicatus* (REUSS) is very abundant in facies of sandy calcareous conglomerate and clay organo-detrital limestone of Lower Turonian age in the Bohemian Cretaceous Basin. Since it is absent in sediments of other stratigraphical stages within this sedimentation area, it can be regarded as a good index species of the Lower Turonian stage.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Běstvína near Ronov, Kamajka, Kaňk, Kutná Hora — Turkaňk, Malnice, Nová Ves near Kolín, Předboj, Radim near Pečky, Starkoč near Čáslav, Velim — Skalka, Vítězov, Zbyslav No. 51, Žehušice.

Pomatoceros lophiodus (GOLDFUSS), 1833

1833 *Serpula lophiodus* n. sp. — A. GOLDFUSS: Petr. Germ.

Type horizon: Upper Cenomanian.

Type locality: Radovesnice near Kolín.

Material: One complete specimen No. 0 5403, NMP, and 42 fragments of various parts of tube of strongly calcareous rocks.

Diagnosis: Species *Pomatoceros* PHILIPPI with minute shell, once S-shaped, with low curved ridge.

Description: Small smooth tube (max. length 17 mm, max. cross-section 1,1 mm) does not bear any sculptures on its surface, except a low elongate ridge on the dorsal side of the tube. The sidge and thick layers of serpulids display characteristically triangular tube section. Lumen circular, narrowing posteriorly so as to taper sharply, and as much as 0.7 mm in cross-section. No plates have been found in the species. Aperture funnel-shaped.

Remarks and relations: Both *P. lophiodus* and *P. trachinus* are relatively abundant in a facies of organodetrital or sandy-clay lime-

stones of Upper Cenomanian age. Their occurrence only in this horizon makes them good correlation species for it.

Stratigraphical range and localities in the Bohemian Cretaceous; Cenomanian — Brázdím, Holubice, Chroustov, Korycany, Mezholezy, Miskovice, Radovesnice.

Pomatoceros trachinus (GOLDFUSS), 1833

1833 *Serpula trachinus* n. sp. — A. GOLDFUSS: Petrefacta, p. 235, Pl. 70, Fig. 1

1961 *Pomatoceros Trachinus* GOLDFUSS — H. REGENHARDT: Serpulidae, p. 49

Holotype: Specimen depicted by A. GOLDFUSS (1833) on pl. 70, fig. 1.

Type horizon: Cenomanian.

Type locality: Saxony — glauconitic sandstone facies.

Material: 56 fragments of various parts of tube, 70 percent being cemented in sandy-clay or organodetrital limestones.

Description: Minute, S-shaped tube with curved dorsal ridge traceable over entire length of tube. Tube triangular in section and attached throughout its entire length to substratum by means of robust, cellular serpulids layers. Length of serpulæ as much as 22 mm. Lumen circular; diameter of tube cross-section up to 1.6 mm; wall thickness 0.2 mm. Tabulae not observed. Apart from longitudinal ridge, tube has no other sculptures. Aperture funnelshaped.

Remarks and relations: The importance of *P. trachinus* has been mentioned together with *P. lophiodus* (GOLDFUSS).

Stratigraphical range and localities in the Bohemian Cretaceous: Bezděčín, Holubice, Chroustov, Korycany, Kozomín, Mezholezy, Miskovice, Nebovidy, Plaňany and Radovesnice.

Pomatoceros triangularis (MÜNSTER), 1831

(Pl. IV, Fig. 11)

1831 *Serpula triangularis* MÜNSTER — A. GOLDFUSS: Petrefacta, p. 236, Pl. 70, Fig. 4

1956 *Serpula (Dorsoserpula) triangularis* MÜNSTER — K. O. PARŠCH: Die Serpulidae, p. 221, Pl. 21, Fig. 12

Holotype: Specimen shown by A. GOLDFUSS (1831) as pl. 70, fig. 4

Type horizon: Turonian

Material: 7 free fragments of central and anterior parts of tube, consisting of calcitic material; 2 fragments of posterior part.

Description: S-shaped tube which adheres along its entire length to substratum. Cellular layers of serpulids weakly developed, with U-shaped striae extending along their sides. Ridge runs across entire tube, and striae end in its central part. Transverse sculptures (forrows) are weakly developed or are not developed at all. Tube triangular in cross-section. Lumen circular, narrowing posteriorly so as to taper sharply; its diameter 1.8—2.1 mm. Wall thickness 0.5 mm. Tube length ranges from 30 to 45 mm. No tabulae discernible. Aperture funnel-shaped.

Remarks and relations: *P. triangularis* (MÜNSTER) shows close relationships to *P. ares* n. sp., but the later is larger.

P. triangularis (MÜNSTER) sometimes (i. e. in two specimens) lack a ridge and thus the tube is not characteristically triangular cross-section.

On the other hand, the appearance of the cellular layers and S-shaped tube are features reliable enough to distinguish the species from members of the genus *Serpula* LINNAEUS.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Předboj, Velim.

Genus *Proliserpula* REGENHARDT, 1961

Proliserpula ampullacea (SOWERBY), 1829

(Pl. V, Fig. 1, 2)

1829 *Serpula ampullacea* n. sp. — J. SOWERBY (1829: The Mineral etc. p. 199, Pl. 597, Fig. 2

1961 *Proliserpula (Proliserpula) ampullacea* (Sowerby) — H. REGENHARDT: Serpulidae etc., p. 54

Holotype: Specimen shown by J. SOWERBY (1829) on pl. 597, fig. 2

Type horizon: Turonian

Type locality: Norwich

Material: 17 complete specimens mostly isolated from rock; 96 fragments of various parts of tube; 41 percent are cemented in rocks. Fragments are particularly damaged.

Description: Tube weakly curved or straight, attached to substratum along its entire length by means of well developed cellular layers of serpulids. Tube circular; diameter of cross-section as much as 1.8—2.2 mm. Lumen circular 1.6—1.7 mm in diameter at aperture, narrowing posteriorly and finally rounded. Wall thickness never exceeds 0.2 mm. In the posterior part of the tube three complete tabulae can be seen, and incomplete ones have not been found. Sculpture weak, consisting of transverse wrinkles and shallow V-shaped striae which extend longitudinally but disappear before posterior part of tube. Tube swollen anteriorly and possesses "ampullacea-type" aperture. Its length varies between 30 and 37 mm.

Remarks and relations: A similar type of aperture can also be observed in *Serpula prolifera* GOLDFUSS, but it is smaller and its longitudinal striae are discernible along the entire length of the tube.

This species is very abundant in sediments of the Cretaceous of Bohemia, ranging in age from Cenomanian to Turonian.

Stratigraphical range and localities in the Bohemian Cretaceous: Upper Cenomanian — Bášť, Bílina, Korycany, Radovesnice, Šilinky near Bílina; Lower Turonian — Kamajka, Kaňk, Předboj, Velim - Skalka, Zbyslav (No 51); Middle Turonian — Čejtice, Česká Třebová, Dolánky, Hledsebe near Mělník, Choceň, Klokočské Loučky, Libeň, Muzlov, Písník and Zvířetice.

Proliserpula ornata nov. spec.

(Pl. V., Fig. 3)

Holotype: No 0 5166 Collection of V. Ziegler, in the National Museum in Prague, and designated on pl. V, fig. 3.

Type horizon: Lower Turonian

Type locality: Velim - Skalka, pocket Václav

Derivation of name: ornata — after the ornamental sculpture on the anterior part of tube.

Material: One complete specimen and 9 fragments of the anterior part of tube.

Diagnosis: A species of the genus *Proliserpula* REGENHARDT with an unattached posterior part of the tube showing distinct sculpture.

Description: Irregularly curved tube having its posterior and central parts attached to bysement by means of weakly developed cellular layers of serpulids. Anterior part is not attached to basement, but is more or less erect relative to the other parts of the tube. Cross-section of tube circular and ranges from 1.1 to 1.3 mm. Lumen circular, its cross-section being 0.7—0.8 mm; it narrows posteriorly and ends in circular aperture. Two true tabulae developed in posterior part of tube, thickness of which is equal to that of tube wall (0.2 mm). Sculpture prominent also in anterior part of tube (i. e. U-shaped transverse to oblique mounds and striae). Longitudinal, narrow, rounded ridge is also developed which terminates in the central part of tube. Ampullacea type aperture is present.

Remarks and relations: *P. ornata* nov. spec. may be distinguished from the other species of the genus *Proliserpula* REGENHARDT by an unattached and erected anterior part of the tube. This species occurs rather rarely.

Stratigraphical range and localities in the Bohemian Cretaceous: Upper Turonian — Starkoč, Velim - Skalka, Vítězov.

Genus *Cycnoserpula* REGENHARDT, 1961

Cycnoserpula fabula nov. spec.

Pl. V, Fig. 4, 5)

Holotype: Specimen No 05164 Collection of V. Ziegler, in the National Museum in Prague, designated on pl. V, fig. 4, 5.

Type horizon: Lower Turonian

Type locality: Velim - Skalka, pocket Václav

Derivation of name: After its nice, fabulous tube

Material: Three complete specimens and 29 fragments of various parts of tube, mostly extracted from rock.

Diagnosis: A species of the genus *Cycnoserpula* REGENHARDT with a small tube bearing transverse, sharp ridges sloping toward anterior end.

Description: Small, circular tube with a distinctly broadened anterior part unattached to substratum and erected above tube level. Tube adhering by middle and posterior parts of tube. Diameter of cross section of tube in anterior and middle parts is 1.7—2 mm and 1.1—1.4 mm, respectively. Lumen circular, 1.5—1.7 mm in diameter, narrowing and tapering in the anterior part toward posterior end of tube. No tabulae have been found. Sculpture visible only in anterior part of tube as sharp ridges inclined toward aperture; middle and posterior parts of tube bear no sculpture. Aperture of ampullacea type.

Remarks and relations: *Cycnoserpula fabula* n. sp. is the only generic member hitherto reported from the Bohemian Cretaceous. Its occurrence is confined to an area of limited areal extent.

Stratigraphical range and localities in the Bohemian Cretaceous: Upper Turonian — Nová Ves near Kolín, Velim - Skalka, Vítězov.

Genus *Eoplacostegus* REGENHARDT, 1961

Eoplacostegus dentatus (NIELSEN), 1931

(Pl. V, Fig. 6, 7)

1931 *Serpentula dentata* n. sp. — K. B. NIELSEN: Serp. Demn., p. 98, Pl. 2, Fig. 9

1961 *Eoplacostegus (Caesicius) dentatus* (NIELSEN) — H. REGENHARDT: Serpulidae . . ., p. 64, Pl. 6, Fig. 9

Holotype: Specimen shown by K. B. NIELSEN (1931) on pl. 2. fig. 9

Type horizon: Jöunger Danian

Type locality: Frederiksholm

Material: 7 complete specimens and 24 fragments of various parts of tube. Both complete specimens and fragmentary tubes are highly mechanically damaged, but sculpture of tubes is particularly contorted.

Description: Circular tube, with its posterior part coiled and fixed to substratum by cellular layers of serpulids. Middle and anterior parts erected. Cross section of tube 1.6—2.1 mm in diameter. Lumen circular; same in diameter throughout length of tube (1.4—1.7 mm). Posterior part bears two true tabulae; middle part contains a varying number (1—4) of incomplete tabulae sculpture on anterior and middle parts of tube consists of four longitudinal rows of denticulate processes two dorsal rows continued into posterior part of tube. Aperture funnel-shaped.

Remarks and relations: H. REGENHARDT (1961) discussed assignment of this species in great detail. The material obtained from the Cretaceous of Bohemia yielded several data on the internal structure of the tube, but few information about its sculpture. Longitudinal rows, "teeth", are so mechanically damaged that only raised "belts" are often discernible.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Běstvína, Kaňk, Starkoč, Velim - Skalka, Zbyslav No 51.

Eoplacostegus sulcatus (SOWERBY, 1829)

(Pl. V, Fig. 8)

1829 *Serpula sulcata* n. sp. — J. SOWERBY: The Mineral . . .

1975 *Serpula cf. sulcata* SOWERBY — S. WARE: Lowel Greensand . . ., Pl. 20, Fig. 7

Holotype unknown

Type horizon: Lower Turonian

Type locality: Velim - Skalka, pocket Václav

Material: 4 complete specimens and 10 fragments of various parts of tube.

Diagnosis: A species of the genus *Eoplacostegus* REGENHARDT with tetragonal cross section of tube and four longitudinal furrows on its anterior and middle parts. Fine transverse furrows concentrically arranged toward the latter. Two dorsal furrows continued onto posterior part of tube.

Description: Tube attached to substratum by coiled posterior end

of tube. Cross section of tube 3.6—4.2 mm in diameter. Lumen circular, 1.8—2.1 mm in diameter; wall thickness 0.9—1.2 mm. Two true tabulae developed posteriorly; incomplete ones absent. Furrows are separated by tube extending toward teeth at aperture (denticulate aperture).

Remarks and relations: S. WARE (1975) ranges the species to the genus *Serpula* LINNAEUS. The author refers it to the genus *Eoplacostegus* REGENHARDT on the basis of the shape of tube, true tabulae, and abundant sculpture.

The species is of limited extent in the Bohemian Cretaceous.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Nová Ves near Kolín, Radim, Velim - Skalka, Vítězov.

Eoplacostegus zbylavus nov. spec.

[Pl. VI, Fig. 1, 2]

Holotype: Specimen No 0 5172 Collection of V. Ziegler, in the National Museum in Prague, designated on pl. V, fig. 1.

Type horizon: Lower Turonian

Type locality: Zbyslav No 51

Derivation of name: After typical (type) locality

Material: 7 complete specimens and 25 fragments of various parts of tube; mostly extracted from rock.

Diagnosis: A species of the genus *Eoplacostegus* REGENHARDT with rope-coiled tube and two prominent longitudinal ridges extending along entire length of tube.

Description: Minute tube fixed to substratum by planispirally coiled posterior end. Cellular layers much developed. Tube and lumen circular in cross section. Cross section of tube and lumen 0.9—1.2 mm and 0.6—1 mm, respectively. Lumen invariable throughout length of tube; two true tabulae developed in posterior part. Sculpture of ropecoiled tube composed of two distinct, longitudinal ridges and fine, irregular, transverse furrows, but these (the latter) are lacking in posterior part of tube. Ridges also projecting at aperture and forming two opposite, sharply terminated teeth (denticulate aperture).

Remarks and relations: This species is the smallest of all hitherto known species of the genus. Like the preceding fossils, *E. zbylavus* n. sp. occurs in an area of limited extent which does not at least overlap with areas occupied by the aforementioned species, but is spatially much remote from them.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Starkoč, Zbyslav, Zbyslav No 51.

Genus *Vepreculina* REGENHARDT, 1961

Vepreculina soukupi nov. spec.

[Pl. VI, Fig. 3]

Holotype: Specimen No 0 5170 Collection of V. Ziegler, in the National Museum in Prague, designated on pl. VI, fig. 3.

Type horizon: Upper Turonian

Type locality: Kučlínský vrch Hill near Bílina

Derivation of name: After J. Soukup, an outstanding Czech geologist.

Material: One fragment of anterior part of tube, 12 mm long, with partially damaged aperture. Bestowed by J. Soukup in 1969.

Diagnosis: A species of the genus *Vepreculina* REGENHARDT, sculpture of which in anterior part of tube consists of oval protuberances and short mounds.

Description: Circular tube with circular lumen. Cross section of tube and lumen in diameter 5.4 and 4.7 mm, respectively. Wall thickness 0.3—0.4 mm.

Remarks and relations: An extensive and the earliest hitherto established species of the genus. H. REGENHARDT (1961) reports species of the genus *Vepreculina* REGENHARDT from the Cenomanian onwards.

Stratigraphical range and localities in the Bohemian Cretaceous: Upper Turonian — Kučlínský vrch Hill near Bílina.

Subfamily *Ditrupinae* REGENHARDT, 1961

Genus *Ditrupa* BERKELEY, 1832

Ditrupa iubata REGENHARDT, 1961

[Pl. VI, Fig. 4]

1961 *Ditrupa iubata* n. sp. — H. REGENHARDT: Serpulidae, p. 76, Pl. 9, Figs. 7, 8

Holotype: Geol. Staatinst. Hamburg, Typ. Kat. No 771

Type horizon: Turonian

Type locality: Froot, France

Material: 23 fragments of various parts of tube, out of which 14 fragments of anterior part with aperture and 3 fragments of posterior part of tube.

Description: Tube thick-walled, straight or gently curved with distinct pentagonal section of outer periphery of tube; unattached to substratum. Length of tube 8.10 mm; cross section of base 2.3—2.6 mm in diameter (at aperture). Lumen slightly narrows toward posterior end bearing two true tabulae. Wall thickness 0.9—1.1 mm. Pentagonal section of tube results especially from five prominent ridges, out of which one lies on dorsal side of tube and particularly high (as much as 2 mm); the two lateral and the two located on ventral side of tube are less high (up to 1 mm). Even or gently undulated areas between ridges. Aperture funnel-shaped.

Remarks and relations: Cross section of tube similar to the species *D. subtorquata* (MÜNSTER), but the latter possesses mounds instead of ridges.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Nová Ves near Kolín, Vítězov.

Ditrupa schlotheimi ROSENKRANTZ, 1920

[Pl. VI, Fig. 5]

1820 *Dentalites leavis* n. sp. — E. F. s. SCHLOTHEIM: Petrefactenkunde, p. 93

1920 *Ditrupa schlotheimi* n. sp. — A. ROSENKRANTZ, Craniakalk fraeta, p. 25, Pl. 2, Figs. 8, 9

H o l o t y p e : Specimen depicted by A. ROSENKRANTZ (1920) on pl. 2, figs. 8,9

T y p e h o r i z o n : Senonian

T y p e l o c a l i t y : Saltholm

M a t e r i a l : Three complete specimens and 12 fragments of various parts of tube, especially (10 fragments) from anterior part with aperture.

D e s c r i p t i o n : Tube gently curved, with funnel-shaped aperture, circular. Its length ranges from 33 to 36 mm, exceptionally to 40 mm; diameter 3.4—3.6 mm; wall thickness 0.9—1.1 mm. Tube thick-walled. Lumen circular, having equal size throughout length of anterior and middle parts. True tabulae et boundary between middle and posterior parts; afterwards base becomes narrower but does not taper sharply. Sculpture consists of V-shaped longitudinal furrows and fine transverse ornamentation. Tube free.

R e m a r k s a n d r e l a t i o n s : *D. schlotheimi* ROSENKRANTZ is rather rare in sediments of Bohemian Cretaceous Basin. Its shape is suggestive of scaphopodes with which it is often confused but may be distinguished by the inner structure of the tube and its wall as well as by the outer end of the posterior part of the tube. This species also occurs in facies other than surf facies.

S t r a t i g r a p h i c a l r a n g e a n d l o c a l i t i e s i n t h e B o h e m i a n C r e t a c e o u s : Lower Turonian — Běstvina, Džbán, Kamajka, Smečno (Smečenská rokle - gorge), Velim - Skalka, Zbyslav No 51.

Ditrupa subtorquata (MÜNSTER), 1831

(Pl. VI, Fig. 6, 7)

1831 *Serpula subtorquata* MÜNSTER — A. GOLDFUSS: Petrefacta, p. 238, Pl. 70, Fig. 11

1941 *Hamulus subtorquatus* (MÜNSTER) — M. AVNIMELECH: Upper Cretaceous ..., p. 7, Figs. 14, 15

1961 *Ditrupa subtorquata* (MÜNSTER) — H. REGENHARDT: Serpulidae ..., p. 76, Pl. 7, Fig. 11

L e c t o t y p e : Geol. Staatinst. Hamburg. Typ. Kat. No 772

T y p e h o r i z o n : Lower Maastrichtian

T y p e l o c a l i t y : Lüneburg

M a t e r i a l : 10 complete specimens and 32 fragments of various parts of tube. 25 percent fragments cemented in rock; two complete specimens have tubes with slightly corroded surface.

D e s c r i p t i o n : Tube slightly curved to straight, with pentagonal cross-section. Its apices bear longitudinal mounds extending along all of tube length. Dorsal mound somewhat more angular, others rounded. Transverse thin furrows developed in most specimens; some specimens with smooth tube. Lumen circular, 1.4—1.7 mm in diameter; its size is invariable in anterior and middle parts, but becomes narrower without tapering sharply in posterior part. Two true tabulae in posterior part. Wall thickness between and on mounds 1—1.2 and as much as 2.3 mm, respectively. Tube up to 50 mm long. Aperture funnel-shaped.

Remarks and relations: Its similarity with *D. iubata* REGENHARDT has been discussed above. In addition to the differences mentioned earlier, *D. subtorquata* possesses a much thicker tube.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Nová Ves near Kolín, Plaňany, Velim, Skalka, Vítězov, Zbyslav, Žehušice - Skalka.

Ditrupa tricostata (GOLDFUSS), 1841

(Pl. VI, Fig. 8, 9)

1841 *Dentalium tricostatum* n. sp. — A. GOLDFUSS: Petrefacta, p. 3, Pl. 166, Fig. 11

1961 *Ditrupa tricostata* (GOLDFUSS) — H. REGENHARDT: Serpulidae..., p. 73

Holotype: Specimen shown by A. GOLDFUSS (1841) on pl. 166, fig. 11

Type horizon: Upper Cenomanian

Type locality: Essen — glauconitic sandstones

Material: 33 fragments of various parts of tube, out of which 20 percent is cemented in rock.

Description: Tube gently curved to straight, unattached to substratum, triangular in cross section. Apices of triangle bear longitudinal mounds extending throughout tube and becoming less robust only in posterior part. Fine transverse striations occur only irregularly in anterior part of tube. Dorsal mound bears a low ridge ending before posterior end of tube. Lumen circular, 1.3—1.5 mm in diameter; wall thickness between and on mounds 1—1.2 and as much as 2 mm, respectively. Length of tube 30—40 mm. Lumen same in diameter along entire length of tube; two true tabulae developed in posterior part. Aperture funnel-shaped.

Remarks and relations: This species is very abundant in surf sediments of Bohemian Cretaceous especially at those places where the sediment is composed predominantly of sand.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Chroustov, Kamajka, Nová Ves near Kolín, Radim, Velim-Skalka, Zbyslav No 51.

Genus *Hamulus* MORTON, 1834

Hamulus hexagonus (ROEMER), 1841

1841 *Serpula hexagona* n. sp. — F. A. ROEMER: Kreideg., p. 100, Pl. 16, Fig. 5

1961 *Hamulus (Hamulus) hexagonus* (ROEMER) — H. REGENHARDT: Serpulidae, p. 81

Holotype: Specimen shown by F. A. ROEMER (1841) on pl. 16, fig. 5.

Type horizon: Cenomanian

Type locality: Essen

Material: 59 fragments of various parts of tube; 80 percent is spatially contorted.

Description: Tube thick-walled, hexagonal in section. Apices of hexagon bear sharp edges extending throughout length of tube. Surface between edges either flat or slightly undulose. Transverse sculpture on tube is represented by thin striae or wrinkles usually concentrically arranged. Lumen circular; wall thickness as much as 2 mm. Posterior part of tube has two tabulae 0.5 mm thick. Aperture funnel-shaped and separated from tube margin by low transverse mound.

Remarks and relations: *H. hexagonus* (ROEMER) in similar to *H. sexsulcatus* (MÜNSTER) in possessing the tube hexagonal in section. However, the former is essentially smaller and occurs only in the Cenomanian, whereas the latter in the Lower Turonian.

H. hexagonus (ROEMER) is common in surf calcareous sandstones of the marine Cenomanian. Although this species has in no one case been found outside the Cenomanian, it seems to be a very useful index species.

Stratigraphical range and localities in the Bohemian Cretaceous: Upper Cenomanian — Bezděčín, Brázdím, Holubice, Chroustov, Kojetice, Korycany, Meholezy, Nebovidy, Nová Ves near Kutná Hora, Předboj, Plaňany, and Radovesnice.

Hamulus sexsulcatus (MÜNSTER), 1831

(Pl. VII, Fig. 5)

1831 *Serpula sexsulcata* MÜNSTER — A. GOLDFUSS: Petrefacta . . . , p. 238, Pl. 70, Fig. 13
1961 *Hamulus sexsulcatus* (MÜNSTER) — H. REGENHARDT: Serpulidae . . . , pp. 80, 81

Holotype: Specimen depicted by A. GOLDFUSS (1831) on pl. 70, fig 13.

Type horizon: Turonian

Type locality: Amberger Eisensand

Material: 62 fragments of various parts of tube; 72 percent is spatially or mechanically damaged.

Description: Tube thick-walled, tusk-like, strongly curved toward posterior end, with hexagonal cross section. Hexagon with apices bearing low mounds running along entire length of tube and decreasing in size toward its posterior end. Flat depressions with vertical walls incised between longitudinal mounds. Transverse sculptures occur as fine striations. Lumen circular, narrowing toward posterior end. One true tabula developed at boundary between middle and posterior parts of tube. Aperture funne-shaped.

Remarks and relations: Its relationship to *H. hexagonus* (ROEMER) is discussed above; relationships to American species of the genus were dealt with in detail by H. REGENHARDT (1961).

H. sexsulcatus (MÜNSTER) is typical of marlstone and marly limestone facies in the surf zone of Lower Turonian age.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Běstvína, Chrtníky, Krakovany, Kutná Hora - Karlov, Libenice, Lipoltice, Markovice, Nová Ves near Kolín, Velim - Skalka, Kolín, [material from abandoned localities called Hvězdův lom and U Prachovny].

Genus *Heptervis* REGENHARDT, 1961

Heptervis septemsulcata (ROEMER), 1841

(Pl. VII, Fig. 3, 4)

1841 *Serpula septemsulcata* — F. A. ROEMER: Nordd. Kreid., p. 101

1922 *Hamulus septemsulcatus* (ROEMER) — B. WADE: Gen. Hamulus, p. 44, Pl. 10, Fig. 10

1961 *Heptervis septemsulcata* (ROEMER) — H. REGENHARDT: Serpulidae, pp. 83, 84

Holotype: Specimen figured by B. WADE (1922) on pl. 10, fig. 10.

Type horizon: Lower Turonian

Type locality: Bayern

Material: 39 fragments of various parts of tube; 90 percent is spatially contorted. Surface of tubes mechanically and chemically damaged.

Description: Tube thick-walled, curved, heptagonal in cross section. Apices of heptagon bear longitudinal mounds, except dorsal apex with ridge. Both mounds and ridge extend for all of length of tube, but become narrower toward posterior end. Lumen circular, narrowing posteriorly so as to taper sharply. Tabulae undeveloped. Transverse sculpture consists of minute striations and mounds, but striae are visible only in posterior part. Aperture funnel-shaped, in vicinity of which is low transverse mound which ends in area of dorsal ridge.

Remarks and relations: The single serpulid species with heptagonal cross-section in the Cretaceous of Bohemia, typical of Lower Turonian marly-sandy and sandy-marly facies.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Chtrníky, Nová Ves near Kolín, Velim, Žehušice, Džbán, Bílá Hora, Dřínov.

Genus *Sclerostyla* MORCH (1863)

Sclerostyla bohemica nov. spec.

(Pl. VII, Fig. 1, 2)

Holotype: Specimen No 0 5163 Collection of V. Ziegler, in the National Museum in Prague, and designated on pl. VII, fig. 1.

Type horizon: Lower Turonian

Type locality: Velim - Skalka, pocket Václav

Derivation of name: After Bohemia, a Latin name of the country.

Material: 4 complete specimens and 23 fragments of various parts of tube; 20 percent is spatially contorted.

Diagnosis: A species of the genus *Sclerostyla* MORCH without transverse sculpture, having base 0.7 mm in size and two true tabulae in posterior part.

Description: Tube bilaterally symmetrical. Anterior and middle parts of tube with seven low longitudinal ridges, out of which three continued onto posterior part of tube. Tube curved nearly at right so that its posterior part is attached to substratum by thin cellular layers of serpulids and its middle as well as anterior parts are erected. Lumen circular, narrowing toward posterior end so as to taper sharply. In addition to two true tabulae, two to three incomplete tabulae form in middle part. Tube diameter as much as 1.3 mm; wall thickness between ridges 0.3 mm. Aperture denticulate; teeth formed by extending all ridges across apertural area.

Remarks and relations: This species remotely resembles *S. septenaria* REGENHARDT, but may be distinguished by its much smaller size.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Starkoč, Velim - Skalka, Zbyslav, Zbyslav No 51.

Subfamily *Spirorbinae* CHAMBERLIN, 1919

Genus *Spirorbis* DAUDIN, 1800

Spirorbis asper (von HAGENOW), 1840

(Pl. VII, Fig. 6)

1840 *Serpula aspera* n. sp. — v. HAGENOW: Mon. Rügen, p. 666

1961 *Spirorbis asper* (v. HAGENOW) — H. REGENHARDT: Serpulidae, p. 88, Pl. 5, Fig. 3

Lectotype: Specimen No 782. Typ. Kat., Geol. Staatinst. Hamburg

Type horizon: Lower Maastrichtian

Type locality: Rügen

Material: 31 complete specimens and 72 fragments of various parts of tube, especially (82 percent) anterior and middle.

Description: Tube minute, planispirally coiled. Posterior part of tube composed of first coil; the other parts consist of second coil, anterior part of tube with aperture resting on second coil. Tube coils not attached firmly to each other. Diameter of circular tube and base 1.8—2 mm and 1.6—1.7 mm, respectively. Lumen narrowing toward posterior part of tube so as to taper sharply. Three thin true tabulae developed in posterior part of tube. Tube wall thickness varies between 0.2 and 0.3 mm. Tube quite smooth; only on dorsal side there is low longitudinal ridge that extends throughout its length.

Remarks and relations: The species just described typically occurs in Lower Turonian sediments of the Džbán plain, in the surroundings of Prague and Slaný. It has often been found to live symbiotically on large shells of molluscs, gastropods and ammonites. In addition, rich occurrences have also been reported from sediments of the Bohemian surf zone of Cretaceous age.

It is much smaller in size than the other serpulid species, except *S. superminor* n. sp., as stated below.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Bílá Hora at Prague, Červený vrch (Prague), Džbán area, Kamajka, Kaňk, Předboj, the vicinity of Slaný, Velim - Skalka, Zbyslav No 51, Žehušice - Skalka.

Spirorbis dagmar nov. spec.

(Pl. VII, Fig. 7, 8)

Holotype: Specimen No 05161 Collection of. V. Ziegler, in the National Museum in Prague, designated on pl. VII, fig. 8.

Type horizon: Lower Turonian

Type locality: Zbyslav No 51

Derivation of name: After euphonious combination of sound̄s.

Material: 17 complete specimens and 14 fragments of various parts of tube. Tubes are 40 percent spatially contorted or crushed.

Diagnosis: A species of the genus *Spirorbis* DAUDIN with thick anterior part of tube, broadly open funnel-shaped aperture, and robust cellular layers of serpulids.

Description: Tube circular, coiled in one spiral, rapidly narrowing toward posterior end of tube and tapering sharply. Lumen likewise circular, narrowing and tapering sharply. Two true tabulae in posterior part. Diameter of tube at aperture 1.7—3 mm; wall thickness 0.1—0.3 mm. Sculpture composed of irregular, fine, transverse striations and furrows.

Remarks and relations: *S. dagmar* n. sp., unlike the other species here described, possesses robust cellular layers and ranks among the largest of the generic members. *S. margarita* n. sp. has its anterior part of tube erect, unattached to substratum. *S. milada* n. sp. and *S. asper* (von HAGENOW) belong to small species, but the former may be distinguished by the presence of a distinct transverse sculpture and the imperceptibly erect anterior part of the tube related to attachment. *S. superminor* n. sp. is very small (tube not more than 0.5 mm in diameter) and, like a larger species of *S. subrugosus* (MÜNSTER), has a spatially developed spiral of its tube. *S. turnoviensis* n. sp. is a larger species containing transverse sculpture on the anterior part of its tube.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Velim - Skalka, Vítězov, Zbyslav, Zbyslav No 51.

Spirorbis margarita nov. spec.

(Pl. VII, Fig. 9)

Holotype: Specimen No 05160 Collection of V. Ziegler, in the National Museum in Prague, and designated on pl. VII, fig. 9.

Type horizon: Lower Turonian (I. labiatus Zone)

Type locality: Zbyslav No 51

Derivation of name: After euphonious combination of sounds.

Material: 10 complete specimens and 24 fragments of different parts of tube. Material is 70 % mechanically damaged and spatially contorted.

Diagnosis: A species of the genus *Spirorbis* DAUDIN having its anterior part erected and unattached to substratum; funnel-shaped aperture is broadened and prominent sculpture can be seen on the anterior part of the tube.

Description: Tube circular, invariable over anterior and middle parts in diameter, but rapidly narrowing to tapering sharply in posterior part. Lumen circular, tapering in posterior part of tube with on true tabulae developed. Tube coiled in one spiral; anterior part overlaps posterior one. Cellular layers of serpulids well developed. Sculpture on anterior part composed of two sharp, transverse ridges, with narrow mound between them. On middle and posterior parts, fine striations. Diameter of the tube at aperture 2—2.5 mm, the wall thickness 0.3—0.4 mm.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian: Předboj, Radim, Velim (Skalka), Zbyslav No 51.

Spirorbis milada nov. spec.

(Pl. VIII, Fig. 1)

Holotype: Specimen No 05158 Collection of V. Ziegler, in the National Museum in Prague, designated on the pl. VIII, fig. 1

Type horizon: Lower Turonian

Type locality: Zbyslav No 51

Derivation of name: After euphonious combination of sounds.

Material: 6 complete specimens and 26 fragments of various parts of the tube. Spatially contorted and mechanically damaged (20 percent).

Diagnosis: A species of the genus *Spirorbis* DAUDIN with minute tube, strongly developed cellular layers of serpulid, and distinct transverse sculpture along entire length of tube.

Description: Tube small, circular, gradually narrowing toward posterior end of tube; coiled in simple spiral. Anterior and posterior ends connected by cellular layers of serpulids. Lumen circular, sharply tapering in posterior part of tube. One true tabula present. Tube at aperture 1.2—1.5 mm in diameter; wall thickness up to 0.2 mm. Tube is ornamented with transverse ridge and mounds irregularly spaced apart. Aperture funnel-shaped, not widened.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Kaňk, Kamajka, Předboj, Velim - Skalka, Zbyslav No 51, Žehušice - Skalka.

Spirorbis subrugosus (MÜNSTER), 1831

(Pl. VIII, Fig. 2)

1831 *Serpula subrugosa* MÜNSTER — A. GOLDFUSS: Petrefacta, p. 239, Pl. 71, Fig. 1

1961 *Spirorbis (Spirorbis) subrugosus* (MÜNSTER) — H. REGENHARDT: Serpulidae... p. 88

Holotype: Specimen described and figured by A. GOLDFUSS (1831) on pl. 71, fig. 1

Type horizon: Upper Cenomanian — Lower Maastrichtian

Type locality: Lüneburg, Westfalen

Material: Three complete specimens and 34 fragments of various parts of tube, especially anterior and middle parts. It is 15 percent spatially contorted.

Description: Tube small, circular, spatially developed into coiled spiral. Posterior part composed of first spiral coil followed by two to three coils. Coils not adherent closely to each other, but free room forms between them. Circular tube 1.3—1.5 mm in diameter; spiral height 5 mm or more. Lumen circular, gradually narrowing and sharply tapering in posterior part of tube bearing three true tabulae. Wall thickness about 0.2 mm but it varies and may be locally as much as 0.4 mm. Sculpture consists of longitudinal, very low ridge visible along entire length of tube and transverse, fine striations on its anterior and middle parts. Aperture not widened, funnel shaped.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Běstvina, Kaňk, Starkoč, Zbyslav, Žehušice - Skalka.

Spirorbis superminor nov. spec.

(Pl. VIII, Fig. 3)

Holotype: Specimen No 0 5159 Collection of. V. Ziegler, in the National Museum in Prague, and designated on pl. VIII, fig. 3.

Type horizon: Lower Turonian

Type locality: Velim - Skalka, pocket Václav

Derivation of name: Smallest known species of genus.

Material: Three complete specimens and 7 fragments of various parts of tube.

Diagnosis: A species of the genus *Spirorbis* DAUDIN with spatially coiled tube and its diameter attaining a value of as much as 0.5 mm at aperture.

Description: Tube very small, spatially coiled, with three spirals; first forms posterior part and half of last spiral of anterior part of tube. Spirals anhere closely to each other and are connected by means of cellular layers of serpulid. Both tube and lumen circular, gradually narrowing so as to taper sharply. Wall thickness 0.07—0.09 mm; three true tabulae in posterior part. Sculpture composed of small, transverse mounds and striations developed on anterior and middle parts of tube. Aperture funnel-shaped, not widened.

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Nová Ves near Kolín, Velim - Skalka, Vítězov.

Spirorbis turnoviensis, nov. spec.

(Pl. VIII, Fig. 4)

1973 *Spirorbis asper* (v. HAGENOW) — V. ZIEGLER: Fauna etc., p. 41, Pl. VI, Fig. 6

Holotype: Specimen No 05173 Collection of V. Ziegler, in the National Museum in Prague, designated on pl. VIII, fig. 4.

Type horizon: Middle Turonian

Type locality: Turnov — Kotlerova zahrada (Kotler's garden)

Derivation of name: After type locality

Material: 7 complete specimens and 53 fragments of tube, mostly attached to shells of nautiloids, ammonites, gastropods and molluscs. In addition, shells have been found to bear traces (or remains of cellular layers of serpulids left by attachment of this species.

Diagnosis: A species of the genus *Spirorbis* DAUDIN having a tube 1.8—2.5 mm in diameter at aperture; anterior part of tube slightly erect, fixed by cellular layers of serpulids to substratum and bearing transverse sculpture on anterior part of tube.

Description: Tube circular, spirally coiled, single parts of tube not overlapping each other. Tube narrows toward its posterior end but does not taper sharply. Base circular, rounded in posterior part. True tabulae undeveloped; only one incomplete tabula developed in posterior part of tube. Wall thickness 0.5—0.7 mm. Anterior part of tube bears prominent transverse sculpture forming mounds and ridges; furthermore, low longitudinal ridge extends along whole length of tube. Aperture funnel-shaped, not widened.

Stratigraphical range and localities in the Bohemian Cretaceous: Middle Turonian — Dolánky near Turnov, Hrubý Rohozec, Muzlov, Svitavy, Sychrov — Železniční tunel, Turnov — Farářství and Kotlerova zahrada; Upper Turonian — Čížkovice, Libochovice, Oškobrň near Poděbrady, Přerov nad Labem, Roudnice, Teplice; Lower Coniacian — surroundings of Hradec Králové (occasional exposures).

Genus *Neomicrorbis* ROVERETO, 1904

Neomicrorbis crenatotriatus (MÜNSTER), 1831

(Pl. VIII, Fig. 5)

1831 *Serpula crenato-striata* MÜNSTER — A. GOLDFUSS: *Petrefacta...*, p. 293, Pl. 597, Figs. 7, 8

1961 *Neomicrorbis crenatostriatus* (MÜNSTER) — H. REGENHARDT: *Serpulidae...*, p. 90, Pl. 9, Fig. 12

Lectotype: Specimen figured by H. REGENHARDT (1961) and deposited in Geol. Staatinst. Hamburg, Typ. Kat. No 783

Type horizon: Danian

Type locality: Bjørndal, Denmark

Material: 7 complete specimens and 24 fragments of various parts of tube; 3 complete specimens and 6 fragments attached to molluscan shells. Tube sculpture much damaged and obliterated by mechanical effects.

Description: Tube small, circular, planispirally coiled, fixed to substratum by weakly developed cellular layers of serpulids. Two coils of tube. Second coil does not override first. Cross section of tube 1.5—1.8 mm. Lumen likewise circular, about 1.2—1.4 mm in diameter at aperture; narrowing toward posterior end of tube so as to taper sharply. One to four true tabulae developed in posterior part. Wall thickness 0.15—0.2 mm. Sculpture consisting of 15 longitudinal rows of granules to spines typically occurring in the species. This feature was noted by H. REGENHARDT (1961) in species diagnosis. Aperture of tube funnel-shaped, not widened. Length of tube about 20 mm.

Remarks and relations: H. REGENHARDT (1961) describes attachment of generic tubes to substratum in detail. Consequently, he distinguished two subgenera: *Neomicrorbis* (attached by belts) and *Granorbis* (attached by granules). The present author, when studying material from the Cretaceous of Bohemia, has found that the two forms of attachment within one tube may grade one into the other. It can be stated, therefore, that both taxons are not substantiated and are not used in this paper.

This species, as compared with another index fossil of the genus from the Cretaceous of Bohemia, *N. knobi* n. sp., can be distinguished by the higher number of longitudinal granular rows. It is thus typical of the sediments of Upper Turonian age.

Stratigraphical range and localities in the Bohemian Cretaceous: Upper Turonian — Čížkovice, Dneboh, Lužice near Bílina, Přerov nad Labem (Hůra), Teplice and Vinařice.

Neomicrorbis knobi nov. spec.

(Pl. VIII, Fig. 6)

Holotype: Specimen No 0 5157 Collection of V. Ziegler, in the National Museum in Prague, designated on pl. VIII, fig. 6.

Type horizon: Lower Turonian

Type locality: Velim - Skalka, pocket Václav

Derivation of name: In honour of Jan Knob, a prominent Czech

museum worker and writer.

Material: Two complete specimens and 40 fragments of various parts of tube, particularly anterior and middle parts.

Diagnosis: A species of the genus *Neomicrorbis* ROVERETO with 12 longitudinal rows of rounded granules and broadened funnel-shaped aperture.

Description: Tube small, circular, attached to substratum by longitudinal belts or granules composed of cellular layers of serpulids. Tube coiled in one spiral, its anterior part being erected. Cross section of tube 1.6–2 mm; wall thickness 1–1.3 mm in diameter at aperture. One or two true tabulae in posterior part of base. Sculpture composed of granular rows described earlier, but these become considerably thinner or are absent (in few fragments) in posterior part of tube.

Remarks and relations: *N. knobi* n. sp. always occurs in large numbers at its localities; single findings are rare (Kamajka and Kaňk).

Stratigraphical range and localities in the Bohemian Cretaceous: Lower Turonian — Běstvina, Kamajka, Kaňk, Sobčice, Velim - Skalka, Vítězov.

Genus *Rotularia* DEFRANCE, 1827

Rotularia (Rotularia) sp.

1973 *Rotularia (Rotularia)* sp. — V. ZIEGLER: Fauna středního turonu. . . , pp. 40, 41, Pl. VI, Fig. 5

Material and description: Three sections of a species of the genus *Rotularia* DEFRANCE were obtained by making sections to examine the species *Sarcinella socialis* (GOLDFUSS). Tube coiled for form a low cone 8 to 15 mm high. Cross section of tube circular and attains 3–3.6 mm in diameter. Tube wall thickness 0.8–1.2 mm. Other features unidentifiable.

Stratigraphical range and localities in the Bohemian Cretaceous: Middle Turonian — Klokočské Loučky, Muzlov.

Notes on phylogenetic development of the family.

The phylogenetic development of the family *Serpulidae* BURMEISTER has rarely and directly been mentioned in papers sofar available.

Serpulid worms probably developed from sabellariid ones with which they belong to the same suborder *Serpulimorpha* and to which they show close relationships in the inner structure of soft body. Serpulids seem to have diverged from sabellariid worms during Ordovician time when the latter, especially the genus *Serpulites* began to appear in large numbers. In the Silurian members of the subfamily *Spirobinae* CHAMBERLIN make their appearance as abundant individuals persisting up to the Recent. Representatives of the subfamily *Serpulinae* RIOJA were first discovered in the Permian. The subfamily *Filograminae* RIOJA did not appear in large number until Mesozoic time, although its first problematic representative has been described even from the Upper Carboniferous (*Josephella ? carinthiaca* W. J. SCHMIDT, 1955). First social types occur as late as the Jurassic (K. O. A. PARSCH, 1956).

A high revolutionary explosion of serpulids took place in Jurassic and Cretaceous times, but during the Tertiary its species became stable and assumed the appearance of recent forms. Approximately 16 species of the genus *Spirorbis* DAUDIN are known from the early Paleozoic (Silurian-Devonian), whereas K. O. A. PARSCH (1956) described about 30 serpulid species from the Jurassic, H. REGENHARDT (1961) 111 species of Cretaceous age (and 53 species discovered by the present author in the Czech Cretaceous, G. ROVERETO (1904) 114 species from the Tertiary of Italy and W. J. SCHMIDT (1955) 76 species from the Tertiary of Austria. This number is similar to that of recent forms, although difference probably exists in the importance of recent and fossil species.

Sabellarid worms have erected or gently curved tubes. It is probable that the first serpulids also had the shape just mentioned. This shape gave rise to two forms: coiled and thread-like, on the one hand, and uncoiled, on the other.

Size varied from small Paleozoic forms to trough gradually growing specimens to largest forms in Cretaceous, Tertiary and Recent times.

Change in size was accompanied by the variability in sculpture and aperture. The smooth or vaguely wrinkled surface of tubes of the first *Spirorbis*-members grades into complex sculpture of both spirorbis and serpulid specimens. In Filograna-members, the weakly developed sculptures gradually disappear during their evolution.

Sculptures change from transverse to longitudinal shape and aperture grades from simple, funnel-shaped through broadly funnel-shaped to more complex types.

In conclusion, it can be stated that the family *Serpulidae* BURMEISTER reached its came of evolution and flourish in the Cretaceous and Tertiary.

Notes on ecology of the family in the Bohemian Cretaceous.

The members of the family *Serpulidae* BUREMEISTER are mostly dwellers of shallow sea in which they live attached to various object of the floor or rest free on a sandy substratum (*Ditrupea*).

In Bohemian Cretaceous, the great majority of finds are from nearshore, insular or surf facies (M. MALKOVSKÝ et al. 1974) of marine Cenomanian and Lower Turonian. Numerous discoveries, with special regard to numbers of individuals, have also been made in calcareous sandstones to sandy limestones or limestones. On the other hand, serpulids are rare in pelitic facies or block sandstones, living mostly as symbionts of large molluscan animals in attachment to their shells.

Serpulids use shells of molluscs, gastropods, brachiopods, and ammonites as basis for attachment of their own shells in the surf zone as well. They also benefit from solid inorganic substratum to fix themselves in a special direction (Velim, Karlov near Kutná Hora).

Social forms occur either as disarranged masser or as frequently bifurcating strings (*Sarcinella*) in response to their nature. They may be found clustered in large numbers and very often form fossil assemblages.

Social forms adhere to the shells of other animals as typical commensals both in life and especially after death of such organismus. Serpulids

are less abundant at those places where remains of echinoids, gastropods and crabs are found in large numbers.

Serpulid worms represent a typical component of the invertebrate fauna in the Bohemian Cretaceous.

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ČELEĎ SERPULIDAE (POLYCHAETA, SEDENTARIA)
Z ČESKÉ KŘÍDOVÉ PÁNVE

Ve své práci se zabývám studiem čeledi *Serpulidae* BURMEISTER z české křídové pánve, která nebyla dosud u nás podrobně zpracována. Některé druhy byly popsány v pracích A. FRÍČE (1870—1911), některé druhy jsou zaznamenány v různých faunistických seznamech. Zjistil jsem v nejrůznějších sedimentech české křídvy 23, z toho 1 nový, rodů a 55, z toho 23 nových druhů příslušníků čeledi *Serpulidae* BURMEISTER.

Serpulidními červy na území Československa se dosud podrobněji zabývali pouze F. PRANTL (1948), který sledoval jejich výskyt v paleozoiku a P. ČTYŘOKÝ (1959), který studoval druh *Ditrupea cornea* (LINNAEUS) v terciéru jižní Moravy.

Ke studiu serpulidů české křídové pánve jsem shromáždil na 3000 jedinců, z toho pouze však 311 bylo kompletních. Ostatní materiál tvoří úlomky. Dále jsem prostudoval sbírky Národního muzea v Praze, sbírky muzeí v Moravské Třebové, v Poděbradech a v Turnově a sbírky Přírodovědecké fakulty Univerzity Karlovy.

Rourky čeledi *Serpulidae* BURMEISTER se v české křídě vyskytují od mořského cenomanu (zóna *Inoceramus pictus*) až do coniaaku (zóna *I. involutus*). Ve svrchním coniaaku (zóna *I. undulatopectatus*) (M. MALKOVSKÝ et al. 1974) nebyli serpulidní červi dosud zjištěni. Maximální výskyt rourek serpulidních červů je ve vápnito-jílovitých pískovcích a slínovcích, ve vápnito-jílovité mezerní hmotě konglomerátů a v jílovitých organodetritických vápencích příbojového pásma spodního turonu, dále v podobných horninách cenomanu a ve vápnitých pískovcích až písčítých vápencích středního turonu. V ostatních sedimentech je výskyt serpulidních červů menší až vzácný. Rourky jsou obvykle dobře prostorově zachovány, avšak z 90 procent případů jsou fragmentární. Je to způsobeno především původním mechanickým porušením schránek, dále diagenetickými pochody a někdy i chemickou korozí (migrace prvků). Materiál rourek je tvořen kalcitem.

EXPLANATIONS OF THE PLATES

VYSVĚTLIVKY K TABULÍM

PLATE I.

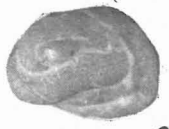
- Fig. 1. *Filograna congesticia* REGENHARDT — Zbyslav — Lower Turonian. Coll. of V. Ziegler, NMP [NMP = the National Museum in Prague] — No. 05366
- Fig. 2. *Filograna congesticia* REGENHARDT — Plaňany — Upper Cenomanian. Coll. of V. Ziegler, NMP — No. O 5367
- Fig. 3. *Glomerula gordialis* [SCHLOTHEIM] — Sobčice — Upper Cenomanian. Coll. of V. Ziegler, NMP — No. O 5368
- Fig. 4. *Glomerula gordialis* [SCHLOTHEIM] — Sobčice — Upper Cenomanian. Coll. of V. Ziegler, NMP — No. O 5368
- Fig. 5. *Glomerula gordialis* [SCHLOTHEIM] — Velim — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5369
- Fig. 6. *Glomerula nuntia* sp. nov. Běstvína near Ronov — Lower Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5174
- Fig. 7. *Glomerula scitula* REGENHARDT — Běstvína near Ronov — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5370
- Fig. 8. *Glomerula solitaria* REGENHARDT — Kamajka north quarry — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5371
- Fig. 9. *Glomerula solitaria* REGENHARDT — Kamajka, north quarry — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5372

PLATE II.

- Fig. 1. *Jereminella spinari* sp. nov. — Liběšice near Bílina — Upper Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5169
- Fig. 2. *Protula planianica* sp. nov. — Plaňany — Lower Turonian. Coll. geologica of NMP — holotype No. O 1733
- Fig. 3. *Protula planianica* sp. nov. — Plaňany — Lower Turonian. Coll. geologica of NMP — holotype No. O 1733
- Fig. 4. *Sarcinella minor* sp. nov. — Velim — Lower Turonian — Coll. of V. Ziegler, NMP — holotype No. O 5156
- Fig. 5. *Sarcinella minor* sp. nov. — Kaňk near Kutná Hora — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5373
- Fig. 6. *Sarcinella plexus* [SOWERBY] — Moravská Třebová — Upper Cenomanian. Coll. of the Museum of Moravská Třebová — No. 604
- Fig. 7, 8. *Sarcinella socialis* [GOLDFUSS] — Muzlov near Svitavy — Middle Turonian. Coll. of V. Ziegler, NMP — No. O 5364, O 5365

PLATE III.

- Fig. 1. *Serpula antiquata* [SOWERBY] — Kamajka, north quarry — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5374
- Fig. 2. *Serpula conjuncta* GEINITZ — Moravská Třebová — Upper Cenomanian. Coll. of Museum Moravská Třebová — No. 741
- Fig. 3. *Serpula prolifera* GOLDFUSS — Starkoč — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5375
- Fig. 4. *Serpula rauca* sp. nov. — Zbyslav near Čáslav, No. 51 — Lower Turonian. Coll. geologica of NMP — holotype No. O 1735
- Fig. 5. *Serpula rauca* sp. nov. Zbyslav near Čáslav, No. 51 — Lower Turonian. Coll. geologica of NMP — holotype No. O 1735
- Fig. 6. *Spiraserpula spirographis* [GOLDFUSS] — Zbyslav near Čáslav — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5376



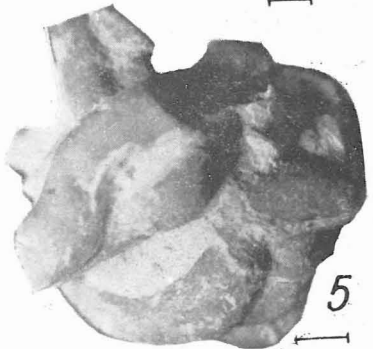
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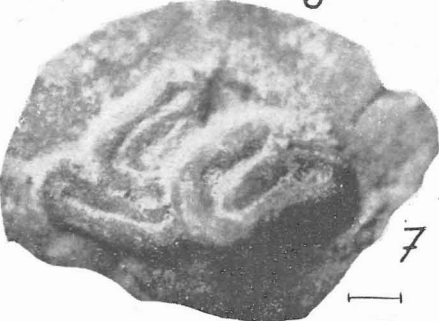
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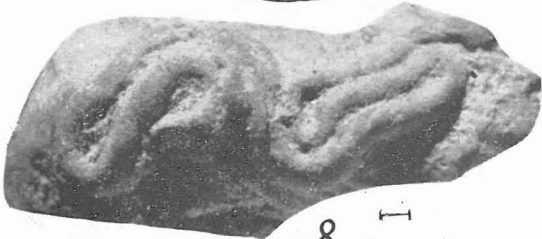
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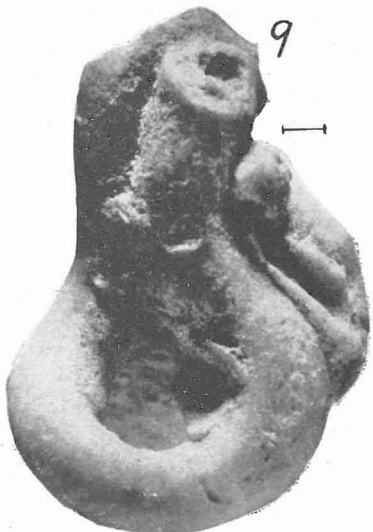
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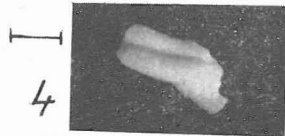
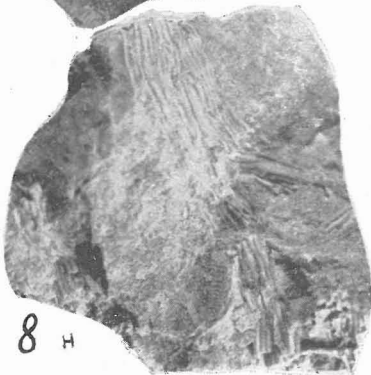
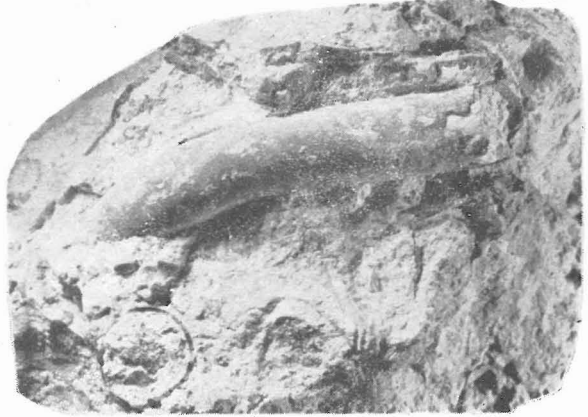
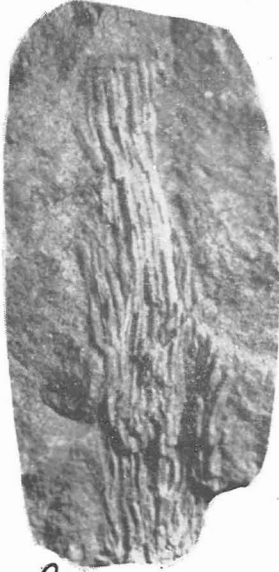
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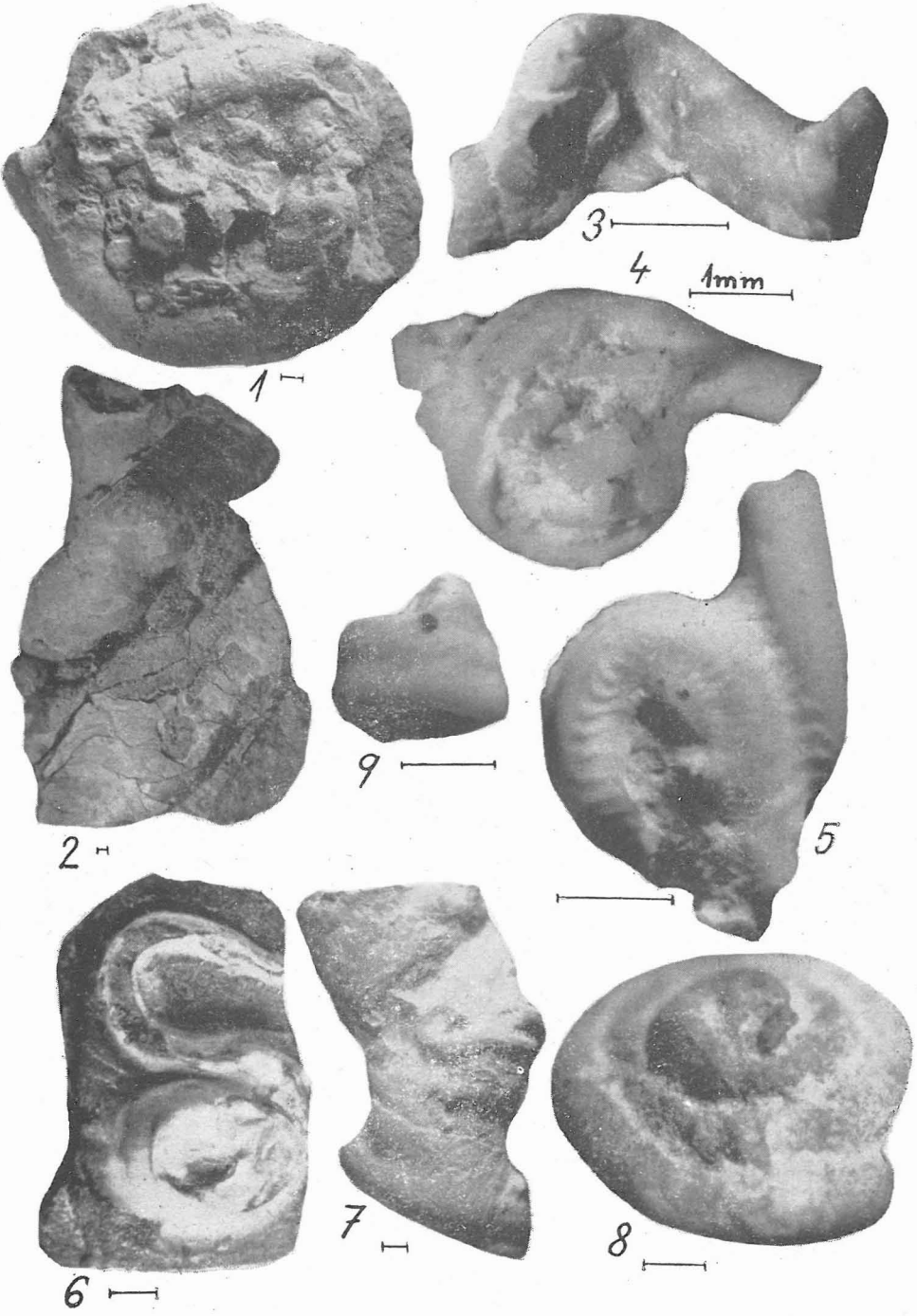


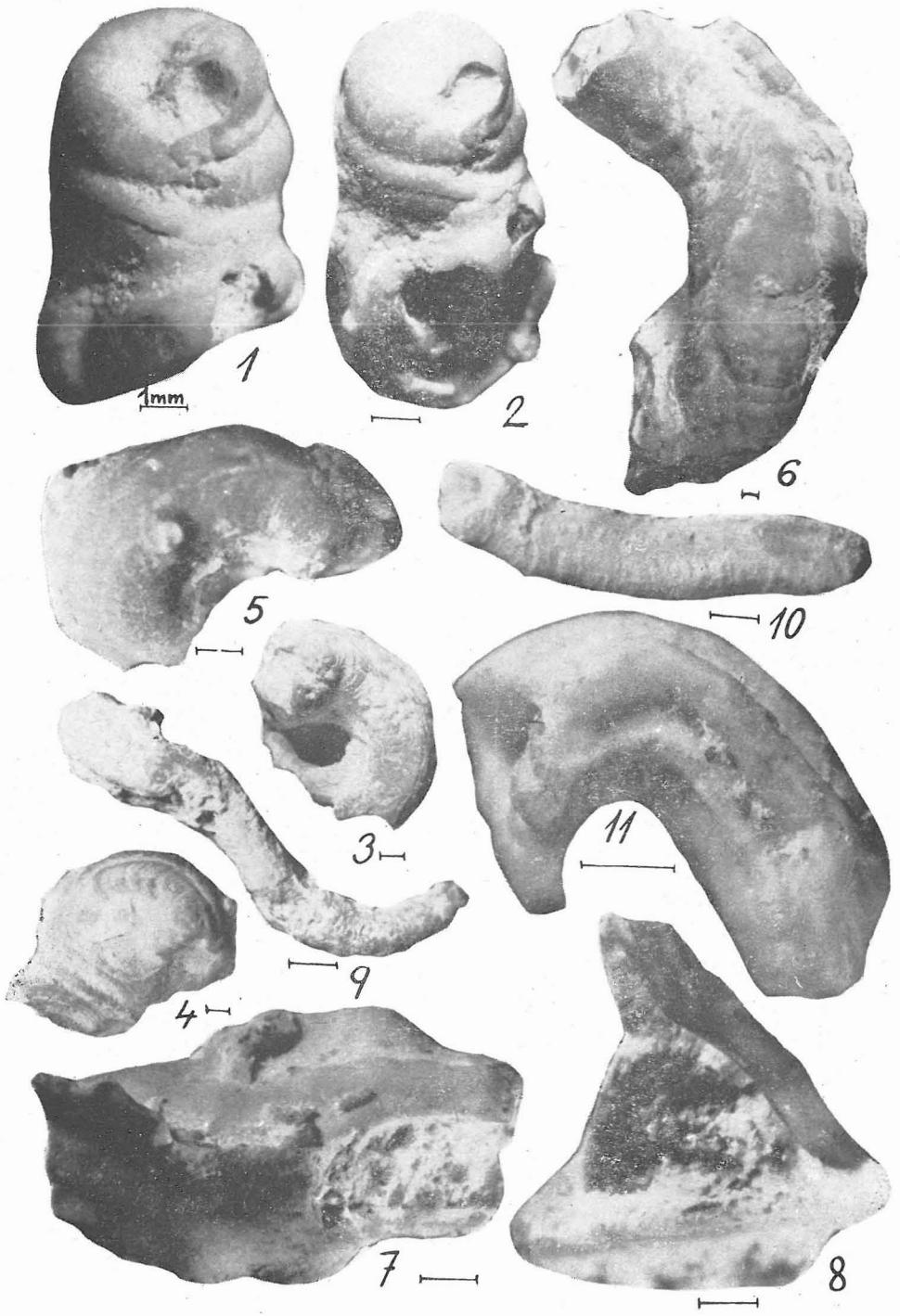
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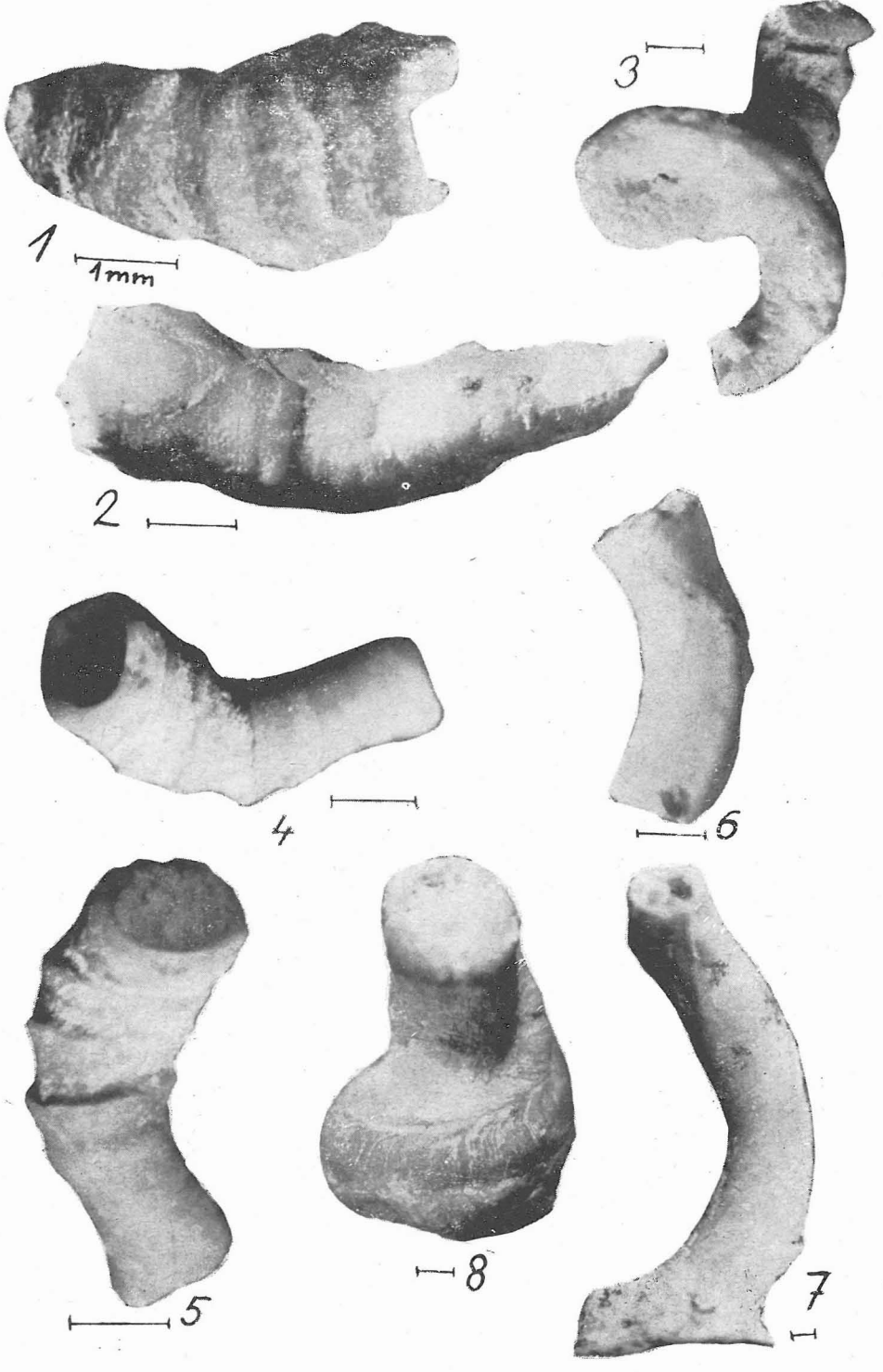


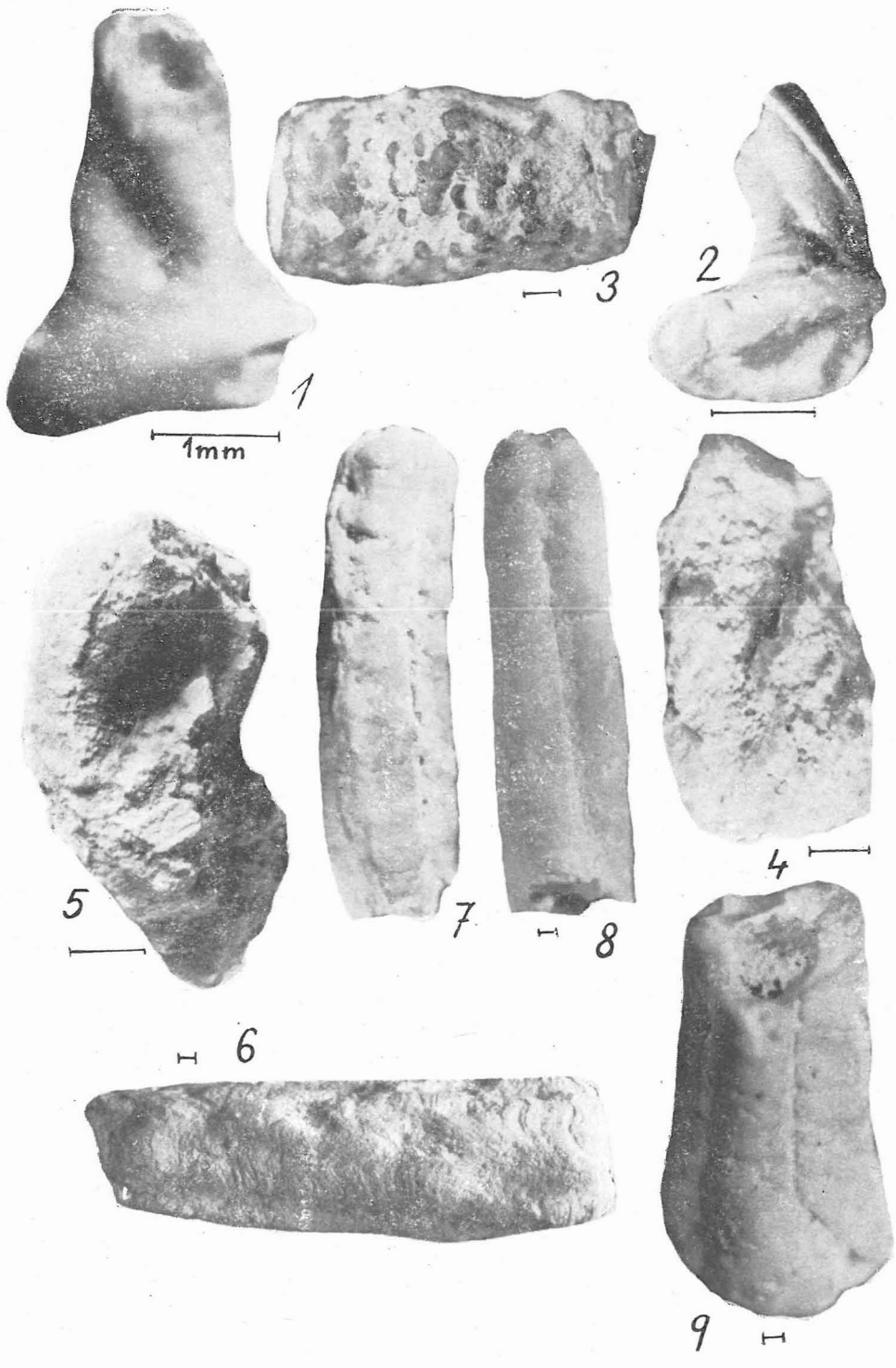
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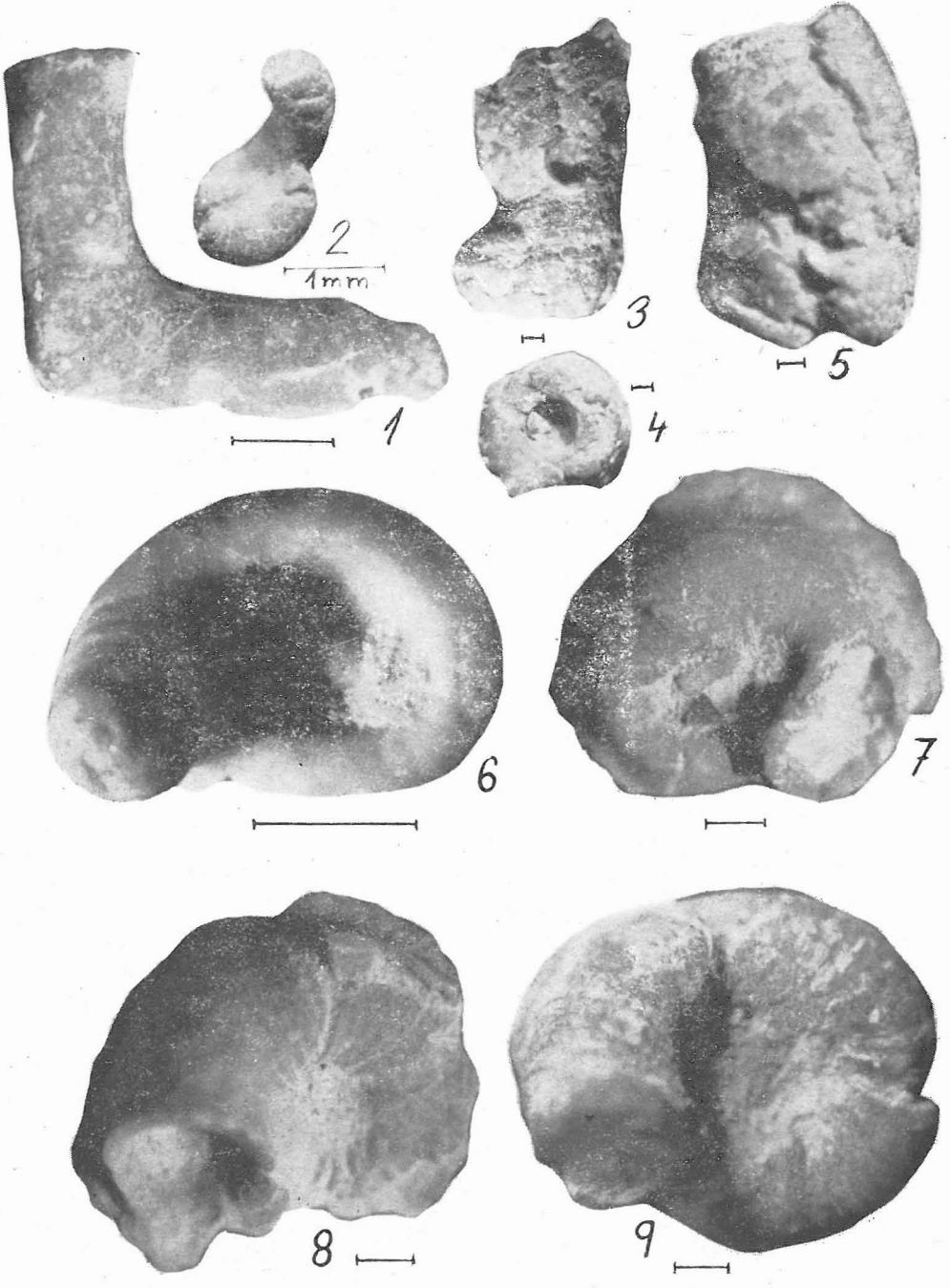


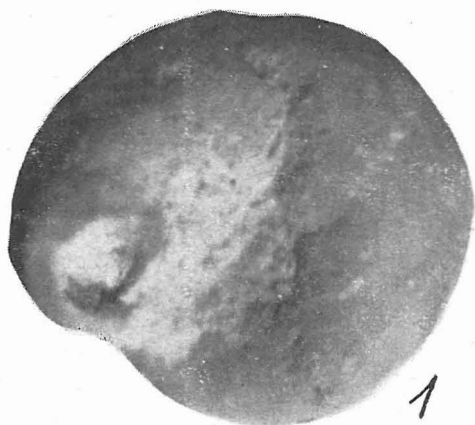








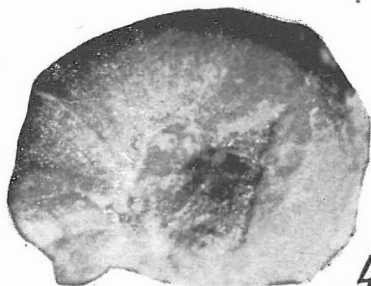




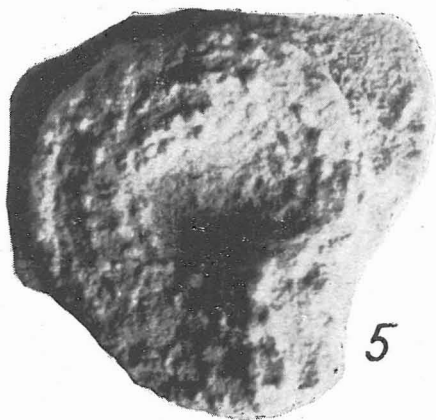
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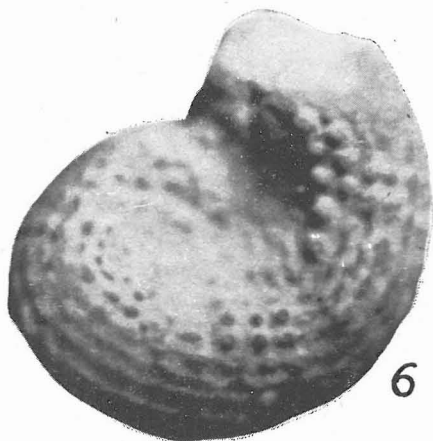
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- Fig. 7. *Spiraserpula spirographis* (GOLDFUSS) — *Mucroserpula arcuata* (MÜNSTER) — Velim — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5377
- Fig. 8. *Spiraserpula subinvoluta* (REUSS) — Sobčice — Upper Cenomanian. Coll. of V. Ziegler, NMP — No. O 5378
- Fig. 9. *Martina parva* sp. nov. — Předboj — Lower Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5117

PLATE IV.

- Fig. 1. *Martina martina* gen. et sp. nov. Velim — Lower Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5165
- Fig. 2. *Martina martina* gen. et sp. nov. Velim — Lower Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5165
- Fig. 3. *Mucroserpula arcuata* (MÜNSTER) — Zbyslav near Čáslav, No. 51 — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5379
- Fig. 4. *Mucroserpula arcuata* (MÜNSTER) — Zbyslav near Čáslav, No. 51 — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5380
- Fig. 5. *Mucroserpula mucroserpula* REGENHARDT — Zbyslav near Čáslav, No. 51 — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5381
- Fig. 6. *Mucroserpula velimia* sp. nov. — Velim — Lower Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5168
- Fig. 7. *Pomatoceros ares* sp. nov. — Velim — Lower Turonian. Coll. geologica of NMP — holotype No. O 1734
- Fig. 8. *Pomatoceros ares* sp. nov. — Velim — Lower Turonian. Coll. geologica of NMP — holotype No. O 1734
- Fig. 9. *Pomatoceros biplicatus* REUSS — Zbyslav near Čáslav, No. 51 — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5382
- Fig. 10. *Pomatoceros trachinus* (GOLDFUSS) — Radovesnice — Upper Cenomanian. Coll. of V. Ziegler, NMP — No. O 5383
- Fig. 11. *Pomatoceros triangularis* (MÜNSTER) — Předboj — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5384

PLATE V.

- Fig. 1. *Proliserpula ampullacea* (SOWERBY) — Zbyslav near Čáslav, No. 51 — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5385
- Fig. 2. *Proliserpula ampullacea* (SOWERBY) — Zbyslav near Čáslav, No. 51 — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5386
- Fig. 3. *Proliserpula ornata* sp. nov. Velim — Lower Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5166
- Fig. 4. *Cynoserpula fabula* sp. nov. — Velim — Lower Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5164
- Fig. 5. *Cynoserpula fabula* sp. nov. — Velim — Lower Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5164
- Fig. 6. *Eoplacostegus dentatus* (NIELSEN) — Kaňk — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5387
- Fig. 7. *Eoplacostegus dentatus* (NIELSEN) — Předboj — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5388
- Fig. 8. *Eoplacostegus sulcatus* (SOWERBY) — Velim — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5389

PLATE VI.

- Fig. 1. *Eoplacostegus zbyslavus* sp. nov. — Zbyslav near Čáslav, No 51 — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5390
- Fig. 2. *Eoplacostegus zbyslavus* sp. nov. — Zbyslav near Čáslav, No 51 — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5390
- Fig. 3. *Vepreculina soukupi* sp. nov. — Kučlínský vrch [Kučlín Rill] — Upper Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5170
- Fig. 4. *Ditrupea iubata* REGENHARDT — Nová Ves near Kolín — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5391

- Fig. 5. *Ditrupa schlotheimi* ROSENKRANTZ — Kamajka — Lower Turonian. Coll. V. Ziegler, NMP — No. O 5392
- Fig. 6. *Ditrupa subtorquata* (MÜNSTER) — Velim — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5393
- Fig. 7. *Ditrupa subtorquata* (MÜNSTER) — Nová Ves near Kolín — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5363
- Fig. 8. *Ditrupa tricostata* (GOLDFUSS) — Velim — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5394
- Fig. 9. *Ditrupa tricostata* (GOLDFUSS) — Velim — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5395

PLATE VII.

- Fig. 1. *Sclerostyla bohémica* sp. nov. — Velim — Lower Turonian. Coll. of V. Ziegler NMP — holotype No. O 5163
- Fig. 2. *Sclerostyla bohémica* sp. nov. — Zbyslav near Čáslav, No. 51 — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5396
- Fig. 3. *Heptervis septemsulcata* (ROEMER) — Zbyslav near Čáslav, No. 51 — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5397
- Fig. 4. *Heptervis septemsulcata* (ROEMER) — Zbyslav near Čáslav, No. 51 — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5397
- Fig. 5. *Hamulus sexsulcatus* (MÜNSTER) — Velim — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5398
- Fig. 6. *Spirorbis asper* (HAGENOW) — Zbyslav near Čáslav — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5400
- Fig. 7. *Spirorbis dagmar* sp. nov. — Velim — Lower Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5161
- Fig. 8. *Spirorbis dagmar* sp. nov. — Zbyslav near Čáslav, No. 51 — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5399
- Fig. 9. *Spirorbis margarita* sp. nov. — Zbyslav near Čáslav, No. 51 — Lower Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5160

PLATE VIII.

- Fig. 1. *Spirorbis milada* sp. nov. — Velim — Lower Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5158
- Fig. 2. *Spirorbis subrugosus* (MÜNSTER) — Zbyslav — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5401
- Fig. 3. *Spirorbis superminor* sp. nov. — Velim — Lower Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5159
- Fig. 4. *Spirorbis turnoviensis* sp. nov. — Turnov, Kotlerova zahrada (Kotler's garden) — Middle Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5173
- Fig. 5. *Neomicrorbis crenatostriatus* (MÜNSTER) — Sobčice — Lower Turonian. Coll. of V. Ziegler, NMP — No. O 5402
- Fig. 6. *Neomicrorbis knobi* sp. nov. — Velim Lower Turonian. Coll. of V. Ziegler, NMP — holotype No. O 5157